29 October 1991

AMERICAN SAMOA GOVERNMENT
PAGO PAGO, AMERICAN SAMOA 96799

AMERICAN SAMOA HEALTH BULLETIN: DON'T EAT THE FISH IN INNER PAGO PAGO HARBOR !

SUMMARY: A recent study has shown that fish caught in the inner portion of Pago Pago Harbor are not safe to eat and may cause serious health problems. Fishing may continue in the outer harbor but fish caught there should always be gutted and cleaned before eating in order to remove their highly toxic livers. This health advisory will remain in effect until future studies are able to demonstrate that these fish are safe to eat.

INTRODUCTION

The purpose of this bulletin is to provide information about a recent toxicity study that indicated that fish in inner Pago Pago Harbor are not safe to eat.

The study examined the toxicity of seawater, sediments and fish in the inner harbor (defined as that portion of the inner bay between the village of Pago Pago and a line from Leloaloa to the Rainmaker Hotel). The study design was exploratory in nature to see if any of a wide variety of pollutants might be found.

METHODS

The study location, inner Pago Pago Harbor, was chosen because it was thought to be potentially contaminated due to the concentration of industry there, its past military history, and its poor flushing rate of water.

Sampling was conducted at 6 sites within the inner harbor on two dates (April and October 1990). Seawater, sediment and fish samples were tested for about 20 different contaminants: heavy metals, pesticides, PCBs, oil/grease, hydrocarbons, and volatile organics. The fish tested were mullet (anae), jacks (lupo), surgeonfish (pelagi), mojarras (matu), and snapper (tamala).

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FINDINGS

The inner harbor is badly contaminated:

CONTAMINANT	FISH	SEDIMENTS	WATER
Heavy metals	**	**	*
PCBs	*	**	
Pesticides (DDT)	*		
Oil/grease		**	
Hydrocarbons			*
Volatile organics			

* contaminated
** heavily contaminated

Based on information provided by EPA (U.S. Environmental Protection Agency), (1) harbor sediments were moderately to heavily contaminated with heavy metals (arsenic, chromium, copper, nickel, and zinc), the PCB Arochlor 1260, and oil/grease; (2) fish tissues were contaminated with heavy metals (chromium, copper, mercury, lead, and zinc), pesticides (DDT-related), and the PCB Arochlor 1260. If cleaned fish (muscle only) were considered, the contamination was limited to chromium and lead.

HEALTH RISKS

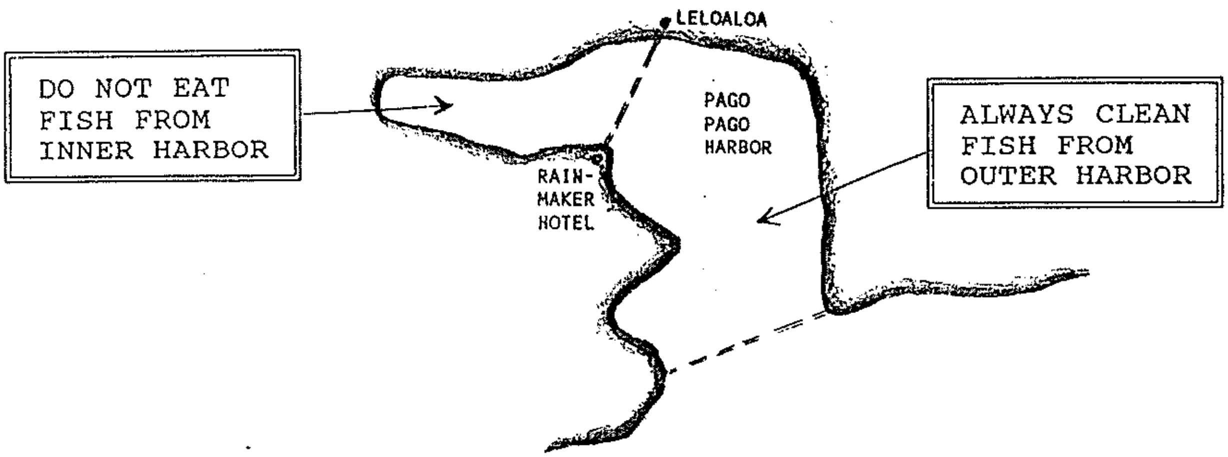
EPA analyzed the data from the inner harbor and found cause for great concern:

1. Potential brain damage. If lead contamination alone is considered, concentrations may reach levels that would cause 70-80% of children who regularly ate 3-4 fish meals per week to suffer a permanent reduction in intelligence.

2. Increased cancer risk. Consuming fish from the inner harbor at a rate of 3-4 meals per week over a life time would significantly increases the risk of cancer due to arsenic contamination.

3. Increased non-cancer health risks. Using a "hazard index" whereby non-cancer health risks occur at levels greater than a value of "1", EPA calculated the hazard index for people consuming inner harbor fish is 1-3 for adults and 2-3 for children.

Consequently, we conclude that fish caught in the inner harbor are NOT SAFE TO EAT (see figure below). The attached list (Table 1) summarizes some of the known health effects of these contaminants.



HEALTH QUESTIONS AND GUIDELINES

1. WHO IS AT GREATEST RISK?
   Answer: Anyone, particularly children, who consume fish caught in the inner harbor. You are strongly advised to reduce or eliminate the amount of harbor fish consumed.

2. WHAT FISH SPECIES ARE AFFECTED?
   Answer: All fish species including shellfish and any other seafood product.

3. HOW DID THE FISH BECOME POISONOUS?
   Answer: Most toxic chemicals, whether from oil spills or old paint chips and car batteries thrown into the harbor, eventually end up in the sediments at the bottom of the harbor. Some fish species feed directly on the bottom or eat invertebrates that live in the bottom, and in doing so the fish also eat the toxic substances. Other fish species eat these contaminated fish, and then they too become contaminated.

4. WILL GUTTING AND CLEANING YOUR CATCH HELP REDUCE THE AMOUNT OF TOXIC CONTAMINATION?

   Answer: Yes. While the toxic chemicals are found throughout the fish's body, the fish's liver is particularly poisonous. Therefore, all fish taken anywhere in the harbor should be gutted and cleaned before eating. This includes small fish as well as large fish.

5. ARE FISH IN THE OUTER HARBOR SAFE TO EAT?

   Answer: Although sampling for this study was limited to the inner harbor, it seems probable that contamination levels would be lower in the outer harbor where oceanographic information indicates that there is more water exchange with clean offshore waters (further studies are needed to verify this). However, all fish caught in the outer harbor should be gutted and cleaned prior to eating.

6. ARE FISH CAUGHT ELSEWHERE AROUND TUTUILA AND MANU'A ISLANDS SAFE TO EAT?

   Answer: Because our islands are washed by clean oceanic waters, and because industrial developments have been restricted to Pago Pago Harbor, we feel that fish caught away from the harbor are safe to eat.

7. WHO IS AT FAULT?

   Answer: The sources of toxic pollutants found in this study are most likely due to the accumulation of contaminants from industrial and military uses over the past century. Naturally occurring concentrations of some heavy metals are also possible. Current discharges of contaminants into the harbor need to be identified but are not likely to be the major causes of the heavy metal problem. Discharges of cannery waste waters, for example, have been tested but show no toxic or heavy metal concentrations.

RECOMMENDED ACTIONS

1. Issue a health advisory and conduct a public eduction program about the risks involved in eating harbor fish.
2. Design and implement a follow-up study.
3. Test blood levels of contaminants in children and other groups in the harbor area.
4. Remediate existing sources of pollution.

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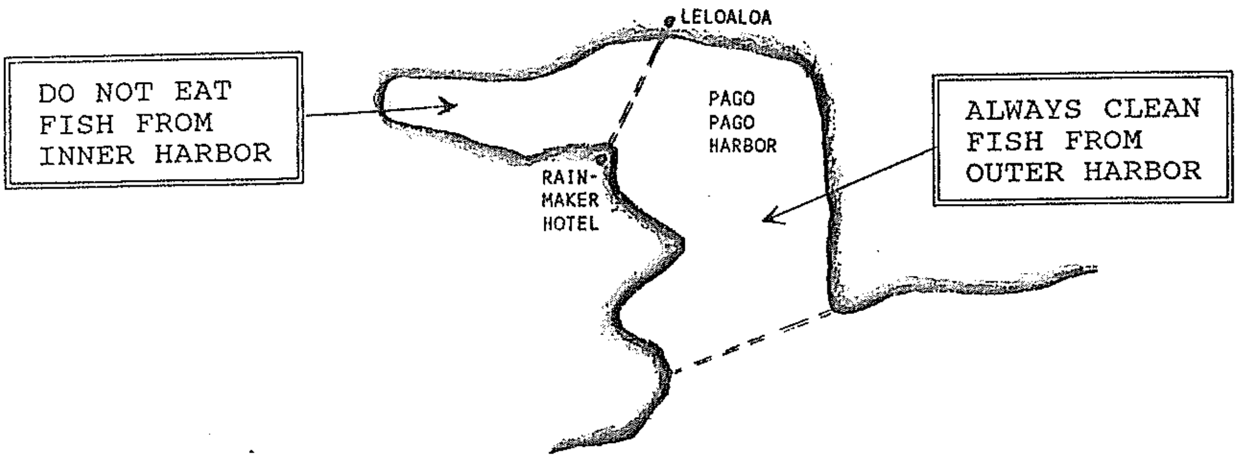

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TABLE 1. Health effects of selected contaminants.

Arsenic:	severe toxicosis (gastrointestinal distress, cardiac effects), nervous system effects, skin changes, cancer
Chromium:	kidney tissue damage, gastrointestinal damage, cancer
Copper:	gastrointestinal irritation
Lead:	mental retardation, reproductive function effects (men), blood cell production effects
Mercury:	kidney damage, nervous system effects, death
Nickel:	respiratory cancer, dermatitis
Silver:	anemia, blue-gray skin
DDT:	convulsions
PCBs:	(Polychlorinated biphyenyls) liver damage, chloracne, peripheral neuropathy

FOR MORE INFORMATION, CALL EPA (633-2304)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105

October 3, 1991

Pati Faiai
Director
American Samoa Environmental
Protection Agency
Office of the Governor
Pago Pago, American Samoa 96799

Re: Review of the Final Draft Report of <u>A Preliminary Toxicity Study of Water, Sediment, and Fish Tissues From Inner Pago Pago Harbor in American Samoa</u> (AECOS, Inc., July 1991)

Dear Pati:

At your request, our office submitted the final draft report of the Pago Pago Harbor Toxicity Study to Region 9's Oceans and Estuaries Section for review by its technical staff. Independent reviews were conducted by David Stuart, Life Scientist, and Dr. Brian Melzian, Regional Oceanographer, and are enclosed. Among other concerns, both Mr. Stuart and Dr. Melzian express great concern with the study's findings of high concentrations of heavy metals, especially of lead in fish tissue. They provide confirmation of our recommendation to you in our letter of August 1, in which we transmitted the results of EPA's risk analysis for consumption of fish in the harbor, of testing children in the harbor area for blood lead levels.

We hope their reviews of the toxicity study will assist you and the American Samoan government in evaluating the study's findings and planning a course of action. The recommended course of action in your letter of August 16th appears prudent. However, we feel that the results for lead in fish tissue obtained by this preliminary study are significant enough to warrant issuing immediately a warning to the public, notably children and pregnant women, regarding the possible health risks of consuming fish from the harbor (especially mullet).

While additional studies are certainly needed, as well as interagency coordination and careful planning for the health advisory and public education program, because of the potential risks of even low levels of lead consumption by pregnant women and children, we feel that the public must be advised of fish consumption risks as soon as possible.

As we have discussed with you in the past, our office is willing to assist you in future activities pertaining to this study and related activities. Dr. Melzian has also indicated that he would be happy to provide assistance in designing any future studies, so that the results will be scientifically valid and statistically reliable.

Please feel free to contact me or Pat Young if you have any questions.

Sincerely,

Norman L. Lovelace
Chief, Office of Pacific Island
and Native American Programs

Enclosures

cc: Sheila Wiegman (w/enclosures)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL RESEARCH LABORATORY
27 TARZWELL DRIVE
NARRAGANSETT, RHODE ISLAND 02882

September 18, 1991

MEMORANDUM

SUBJECT: Review of American Samoan report entitled: A Preliminary Toxicity Study of Water, Sediment, and Fish Tissues from Inner Pago Pago Harbor in American Samoa (AECOS, Inc., 1991)

FROM: Brian D. Melzian, Ph.D. Brian
Regional Oceanographer
Region IX/ERL-N

TO: Janet Hashimoto, Chief rec'd 9/23/91
Marine Protection Section (W-7-1)
Region IX

As requested by Region IX's Office of Pacific Island and Native American Programs, I have completed my review of the Pago Pago Harbor report. I commend the American Samoan Environmental Protection Agency (EPA) for supporting the conduct and completion of this important study. Much useful site-specific data and information were obtained that could be used to protect fish, shellfish, and human consumers of fish and shellfish. However, there are some major deficiencies in some of the data and information that should be corrected (see below).

My major conclusions, comments, and recommendations include the following:

I. MAJOR CONCLUSIONS:

° Based on the data presented in this report (i.e., Tables 15A and 15B, pages 22-23), it probably would be prudent to recommend that MULLET (family Mugilidae) not be caught or eaten if they are caught in the inner portion of Pago Pago Harbor. Both the muscle and liver tissues of these fish were consistenly found to be contaminated with elevated levels of CHROMIUM and LEAD. In order to appreciate the significance of lead contamination in the mullet, please refer to ATTACHMENT A which describes the potential impacts of lead to fish, wildlife and humans.

I also recommend that ATTACHMENT B, entitled TOXICITY ASSESSEMENT OF DREDGED MATERIALS: ACUTE AND CHRONIC TOXICITY AS DETERMINED BY BIOASSAYS AND BIOACCUMULATION TESTS (Melzian, 1990) be consulted. In particular, the sections on "action limits" and human health risks provide information regarding international standards and risk assessment procedures that could be used to determine if fish or shellfish are safe to eat. Note that the median international standard for lead [i.e., 2 ppm, wet weight (Table 7)] was often exceeded in the mullet samples (see Table 15B).

° It is not appropriate to compare any of the Pago Pago Harbor results with the data and information collected in Hawaii. This is especially true when comparing the geochemical, mineralogical, and geomorphological data. No data or information were included which conclusively demonstrated that the volcanic soils on Hawaii are similar to the volcanic soils on American Samoa. On the contrary, much geological research has shown that the alkali basalts that dominate the upper portions of most oceanic islands produce a much wider range of rock compositions, as compared to the tholeiitic basalts that comprise the ocean floors (see pages 213-218: MARINE GEOLOGY (1982); by James Kennett; Prentice Hall). In addition, the geological "hot spot" that formed the Hawaiian islands is not the same as the volcano that formed American Samoa. Hence, the basalts on American Samoa are probably very different than those found on Hawaii. If the basalts are different, the concentrations of various heavy metals in the sediments, caused by the erosion of the native basalts, will be different.

° The methods section in this report was poorly written. There should have been much more discussion about the analytical methods that were used to measure the metals and organic chemicals in the water, sediment, and tissue samples. In addition, all of the POLYNUCLEAR AROMATIC HYDROCARBON (PAH) data are of very poor quality and are useless in making environmental or human health management decisions. This is because the reported PAH detection limits were extremely high (i.e., up to 12,000 ppb) for the sediment and tissue samples collected at some of the sites (see APPENDIX E). It should have been possible to use analytical procedures that had detection limits as low as 100 ppb (e.g. 0.100 ppm). No wonder the samples were reported as ND (not detected)! THIS HIGH DETECTION LIMIT PROBLEM IS A MAJOR DEFICIENCY OF THIS STUDY, and it should be corrected in future sampling programs. Many of the PAHs are known or suspected animal and human carcinogens [e.g., benozo(a)pyrene], and recent research has linked PAH concentrations in sediments to the incidence of cancer in benthic fish and invertebrates (e.g., oysters and flounder).

° Even though the detection limits for the PCB Aroclors© measured in the sediment and tissue samples were not as high as those for the PAHs, they were still much higher than they should be (see Appendix C). Again, it should have been possible to consistently use detection limits in the 50 to 100 ppb range (or lower) for each Aroclor, versus the 50 to 650 ppb range reported. Since the methods section of the report was so poor, it is impossible to tell if the high detection limit problems were due to; 1) the use of packed Gas Chromatography (GC) columns versus capillary GC columns (preferred); or 2) use of terrestrial hazardous waste or Superfund-Type protocols. If these later protocols were used, I suspect that the cleanup procedures needed to remove such interferences as sulfur (sediments) and lipids (tissue) were not employed. Hence, the high detections limits.

Like some of the PAHs, PCBs are known or suspected animal and human carcinogens; and they are known to accumulate in sediments and bioaccumulate and biomagnify in marine food webs. In particular, Aroclor© 1260 has a greater potential for bioaccumulation (e.g., log K_{OW} = 6.91) than the other Aroclors measured in this study. In fact, only three (3) other "priority pollutants" (one phthalate and two PAHs) have a higher bioaccumulation potential. Hence, it would be prudent to conduct additional studies to determine the areal extent of PCBs contamination in Pago Pago Harbor sediments and biota. To learn more about the bioaccumlation potential of various PCB Aroclors and DDT metabolites, please refer to ATTACHMENT C, entitled Chlorinated Hydrocarbons in Lower Continental Slope Fish Collected near the Farallon Islands, California (Melzian et al., 1987).

° I agree with the report's conclusion that COPPER AND ZINC exceeded the acute and chronic WATER QUALITY CRITERIA established by EPA and/or Hawaii. In addition, the seawater concentrations of LEAD exceeded EPA's 4-day WQC (i.e., 5.6 ug/L) by an order of magnitude. Also note that lead was found elevated in sediments found at sites 3, 4, and 6 (see Table 11) ; and mullet tissues were consistently contaminated with lead. LEAD IS A MAJOR PROBLEM IN PAGO PAGO HARBOR.

° Even though AECOS Inc. made a honest attempt to compare the sediment concentrations with "baseline" sediment concentrations found in Pago Pago Harbor, I feel that this comparison exercise was not scientifically justified. In particular, another major deficiency of this study was the fact that the sediment concentrations were reported as WET WEIGHT measurements versus DRY WEIGHT measurements (preferred). Because the water content of sediments can differ greatly, it has become a standard practise during the past two decades to report sediment chemistry data in DRY WEIGHT units. Unfortunately, this was not done (reason unkown) in this study. Because of this, it is not possible to readily compare the sediment data found in Table 11 with any "baseline" values.

ATTACHNMENT D, entitled Florida's Method for Assessing Metals Contamination in Estuarine Sediments (June 1991) could be used by the American Samoa EPA in the future to help identify sediments with elevated metals contamination. This method does not identify sediments that are toxic; instead, it aids in the identification of sediments that may require additional chemical, biological, or toxicological assessments.

II. MAJOR COMMENTS:

- What is NFR (page 2)?

- Pages 3 and 7 were missing from the report. Why?

- Are the fish which are commonly found in the harbor (page 4), also commonly caught from the harbor by recreational fishermen? If yes, are the fish caught at or near the sites sampled?

- WHOLE FISH should not have been used in this study (page 5). This study would have had much more scientific credibility if muscle and liver tissue samples were resected from the fish before the whole fish was frozen. Why? During the freezing process, ice crystals form in the tissues of the fish and cause the cells to lyse. As a result cross-contamination of the tissues commonly occurs.

- It is not appropriate to use the U.S. EPA classification categories found in Table 7 (page 14). These classification categories were developed for freshwater sediments in the Great Lakes and they are now considered outdated.

- Numerous references were not cited in the REFERENCE section. It would have been beneficial to know where the following references were published so I could have obtained copies, if desired.

  - Table 3: Baudo and Muntau, 1990; Kennish, 1989; Bowen, 1979, Dell'Aglio *et al*., 1986; and Krauskopf, 1956.

  - Page 9: USEPA, 1986 & 1987.

  - Page 12: Nakamura and Sherman, 1958; Shea, 1988; Giesy and Hoke, 1990; DOH, 1978; and Jonasson and Timperley, 1975.

  - Table 6: Patterson, 1971; AECOS, 1984; and Lau *et al*., 1973.

  - Table 7: Gambrell *et al*., 1983; and Thomas, 1987

  - Page 15: Naval Undersea Center, 1974; Morris and Youngberg, 1972; and Youngberg, 1973.

  - Page 18: Li, 1984; and Tetra Tech, 1985.

  - Page 20: Jensen and Jernelov, 1969; and Bisogni and Lawrence, 1973.

III. RECOMMENDATIONS:

° Because of the detection limit problems previously discussed, it would be appropriate to collect and analyze additional sediment and tissus samples for both PAHs and PCBs. This recommendation also supports AECOS Inc.'s recommendation to collect more sediment samples to "pinpoint the extent and possibly the source of PCB contamination," and fish samples "to determine whether inner Pago Pago Harbor uniquely has a problem with PCB contamination" (page 32).

° If additional sediment samples are collected in the future, ACID VOLATILE SULFIDES (AVS) and TOTAL ORGANIC CARBON (TOC) should be measured in each sample. Much research in recent years has shown that the AVS in sediments control the bioavailability of divalent metals (e.g., copper, cadmium), and TOC controls the bioavailability of nonpolar organic compounds such as DDTs and PCBs. In fact, EPA is now in the process of developing draft Sediment Quality Criteria for nonpolar organics that are based on the "Equilibrium Partitioning Approach." If desired, Region IX could provide the appropriate analytical protocols for the measurement of AVS and TOC in sediments.

° If additional fish samples are collected in the future, the TOTAL LIPIDS content should be determined in the individual muscle and liver tissue samples. By doing this, the chemical contaminant concentrations could be "normalized;" thus facilitating comparisons between the different species of fish caught at the different sites.

° In order to protect the fishermen who may be catching and consuming fish caught in the inner harbor, I recommend that a fish consumption survey be initiated to determine: a) what species are commomly caught in the harbor; b) what species are commonly consumed; and c) how often the fish are caught and consumed by individual fishermen.

° In order to determine the true "baseline" concentrations of heavy metals in American Samoa SOILS or SEDIMENTS, I recommend that the American Samoa EPA conduct a study to determine the concentrations of metals in soils and sediments collected in areas of America Samoa that are known to be free, or relatively free, of anthropogenic contaminants.

° Finally, in order to determine if EPA's national Water Quality Criteria (WQC) for COPPER, ZINC, and LEAD are applicable to American Samoan waters (see page 9 in the report), "site-specific" WQC could be developed using the guidelines found in EPA's Water Quality Standards Handbook (1983). ATTACHMENT E is a copy of Chapter 4 from the handbook and it describes the recalculation, indicator, and resident species procedures that could be used to develop WQC which reflect local environmental conditions. Of the three procedures, the "Indicator Species" procedure may be the most appropriate for American Samoa. In this procedure, acute toxicity in site water and laboratory water is determined. The difference in toxicity values, expressed as a water effect ratio, is used to convert the national WQC to site-specific WQC (see ATTACHMENT E for more details).

§§§§§§§§§§§§§§§§§§§§§§§§

Please note that many of the conclusions, comments, and recommendations made in this memorandum were previously stated in the memorandum I sent to the American Samoa EPA on September 28, 1990 (ATTACHMENT F). Even though some of my previous technical concerns have been addressed since the September, 1990 memorandum, many of them have not (e.g., detection limit problems, recommendations to measure AVS and TOC, lipids in tissues).

If you have any questions or comments about my review, please call me at FTS 838-6163.

ATTACHMENTS (6)

cc: (w/o Attachments)

Norb Jaworski (ERL-N)
Don Phelps (ERL-N)
Jerry Pesch (ERL-N)
Dave Hansen (ERL-N)

Loretta Barsamian (Region IX)

Attachments to Melzian's 9/18/91 memo

ATTACHMENT A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

July 21, 1989

MEMORANDUM

SUBJECT: Review of lead bioaccumulation and amphipod mortality letter written to Mr. Charles Roberts (Port of Oakland) on June 14, 1989

FROM: Brian D. Melzian, Ph.D. Brian
Regional Oceanographer
Oceans and Estuaries Section (W-7-1)

TO: Loretta Barsamian, Chief
Wetlands, Oceans and Estuaries Branch (W-7)

As requested, I have reviewed the letter and enclosure sent to Mr. Roberts (Port of Oakland) on June 14, 1989. Before reviewing the letter and enclosure, I reviewed the following documents and information:

1) EPA's Ocean Dumping Regulations [i.e., 40 CFR: Parts 227 and 228 (January 11, 1977 as amended)];

2) Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters (U.S. EPA/U.S. COE: April, 1978 "Green Book");

3) 40 CFR (Parts 141 and 142): Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Regulations for Lead and Copper; Proposed Rule (Environmental Protection Agency: Federal Register/Vol. 53, No. 160/ August 18, 1988);

4) 21 CFR (Part 109): Lead From Ceramic Pitchers; Proposed Rule (U.S. Food and Drug Administration: Federal Register/Vol. 54, No. 104/June 1, 1989);

5) Evaluation of the Potential Carcinogenicity of Lead and Lead Compounds: In Support of Reportable Quantity Adjustments Pursuant to CERCLA Section 102 (EPA 600/8-89/045A; External Review Draft; March 1989);

6) Lead Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review (U.S. Fish and Wildlife Service: Report No. 14; April, 1988);

7) Guidance Manual for Assessing Human Health Risks From Chemically Contaminated Fish and Shellfish (U.S. EPA: OMEP; Draft Report C737-01; December 1987);

8) <u>Narragansett Bay Metals: A Problem for Narragansett Bay Quahogs?</u> (In: The First Year of the Narragansett Bay Project: Results and Recommendations; May 1988);

9) Computer printout from OHMTADS (Oil and Hazardous Materials Technical Assistance Data Search) conducted in May, 1989.

10) <u>Bioavailability of Trace Metals to Aquatic Organisms</u> (Luoma, S.N., 1983. "The Science of the Total Environment," 28, pp. 1-22); and

11) <u>Toxicity of Heavy Metals in the Environment</u> (Part 2) Edited by Frederick W. Oehme, Marcel Dekker, Inc., New York, page 623, 1979.

After reviewing in detail all of the above documents, and the letter and enclosure, it is concluded that: a) the letter was very accurate, precise and properly referenced (note exceptions below); b) I could not detect <u>any</u> statement that was either taken out of context or presented in a biased or unobjective manner; and c) EPA's current policies to minimize the exposure of lead to humans and the environment (aerial, terrestrial, and aquatic) is justified and should be strongly encouraged and enforced. In addition, I agree with the solid phase bioassay discussion found in the enclosure (pages 5 and 6).

The following points could be either clarified or corrected to make the letter more accurate and precise:

PLEASE NOTE THAT THE NUMBERS IN [ ] REFER TO THE DOCUMENTS LISTED ABOVE

° Please note that the Maximum Contaminant Level Goals (MCLGs) are non-enforceable health goals. The National Primary Drinking Water Regulations set the enforceable drinking water standards and include either Maximum Contaminant Level (MCL) concentrations or "treatment technique requirements as well at compliance monitoring requirements" (53 Fed. Reg. 31518, August 18, 1988, [3]). The enclosure does state, however, that the MCLs are "set as close to MCLGs as is feasible, taking into account technolgical capabilities and costs" (see footnote # 1, page 3 of the enclosure). The regulations also stipulate that the MCL must be set as close to the MCLG as "feasible." Feasible means "feasible with the use of the best technology, treatment techniques and other means, ... (taking costs into consideration)" (see 53 Fed. Reg. 31518, August 18, 1988, [3]).

° The Federal Register citation found in the second paragraph on page 1 of the enclosure should read 40 C.F.R. §§ 227.18 (g), (<u>h</u>) and not 40 C.F.R. §§ 227.18 (g), (f).

- Footnote # 1, found on page 3 of the enclosure, should be checked to see if the Safe Drinking Water Act was properly cited. In the enclosure, it is cited as 42 U.S.C § 300g-1. In the 1988 regulations, it is cited as 42 U.S.C 300f et seq. (53 Fed. Reg. 31517 [3]).

- I cannot find any statment(s) in the regulations that support the statement that the "FDA indicated that serving food (emphasis added) to very young children with lead levels of 0.1 parts per million would create unacceptable health risks" (see A., first paragraph, page 2 of the enclosure). After thoroughly reviewing 54 Fed. Reg. (21 CFR Part 109, [4]), I could not find any statement that would directly or indirectly support the statement made in the enclosure. The only number that I could find that was similar to the 0.1 ppm number was cited as "0.1 microgram per millileter (ug/mL) of test solution" (see 54 Fed. Reg. 23485, [4]). The federal register number refers to the proposed regulatory limit that would "limit the leaching of lead from the glazes and decorations on the food-contact surface of these pitchers" (54 Fed. Reg. 23485, [4]). The 0.1 ug/mL number can be stated as 0.1 ppm. However, it is not directly referring to food; rather, it is referring to the limit of lead that can be leached from ceramic foodware after exposure to a 4 percent acetic acid solution (see 54 Fed. Reg. 23487, [4]).

  As a result of the above, it is recommended that we delete the 0.1 ppm food value in any future discussions or documents.

- The regulatory language at the top of page 4 in the enclosure would have been more powerful if the entire sentence had been cited. Specifically, the following language could have been cited immediately after "margin of safety": "and EPA has established a policy of setting MCLGs at zero for compounds classified as Group A or B carcinogens" (53 Fed. Reg. 31524, [3]). Lead is now considered a Group B carcinogen (see below).

The following bullets of information summarize important and relevant information found in the regulations and documents reviewed for this analysis (please note that the numbers in [ ] refer to the documents listed on pages 1 and 2 of this memorandum):

- Lead is neither essential nor beneficial to living organisms; all existing data show that its metabolic effects are adverse [6]. Organolead compounds tend to be more toxic than inorganic lead compounds to aquatic organisms [6]. Lead is toxic in most of its chemical forms and can be incorporated into the body of organisms by inhalation, ingestion, skin absorption, and placental transfer to the fetus [6]. Lead is an accumulative metabolic poison that affects behavior, in addition to the blood, vascular, nervous, renal, and reproductive systems [6].

NOTE

- Aquatic sediments are not only "sinks" for lead, but may also act as sources of lead to aquatic biota after contamination from the original source has subsided [6 and 10].

- Studies have been published that showed insignificant correlations between metals in marine and estuarine sediments and the benthic detritus feeding organisms [10]. However, some of these studies used organisms that did not ingest the sediments, had an inadequate statistical design, and in "nearly all cases" the data range was narrow [10]. More extensive studies, especially the one carried out at 50 stations in 17 European estuaries, did show statistically significant correlations between sediment metal concentrations and concentrations in burrowing clams (Scrobicularia plana) and polychaete worms (Nereis diversicolor) [10].

- Food chain biomagnification, although uncommon in terrestrial and most aquatic communities, may be important for carnivorous marine mammals such as the California sea lion (Zalophus californianus) and harbor seals (Phoca vitulina) [6]. Accumulations were highest in hard tissues (e.g., bone and teeth) and lowest in soft tissues (e.g., fat and muscle) [6].

NOTE

- In adult humans, the absorption of ingested lead has been estimated to range from 10 to 15 percent [5]. Fasting humans may absorb 21 percent to about 63 percent [5]. Studies on children show that the average absorption rate was approximately 50 percent for ingested lead as compared to 10 to 15 percent for adults [5]. The absorption rate of different forms of ingested lead appear to be about equal [5]. Absorbed lead is transported via the circulatory system and is distributed to various organs and tissues.

NOTE

- The fraction of absorbed lead retained in the human body ranges from 1 to 5 percent in adults and from 32 to 34 percent in young children [5]. Most of the retained lead is found in the bones and can have a half-life greater then 20 years [5].

NOTE

- The human health effects of lead are generally correlated with lead levels in blood [3]. Lead exposure across a broad range of blood lead levels is "associated with a continuum of pathophysiological effects, including interference with heme (i.e., hemoglobin) synthesis necessary for formation of red blood cells, anemia, kidney damage, impaired reproductive function, interference with vitamin D metabolism, impaired cognitive performance (as measured by IQ tests, performance in school, and other means), delayed neurological and physical development, and elevations in blood pressure" [3]. Lead can also cause stillbirths, miscarriages, inhibited fetus development, and decreased male fertility (including abnormal sperm) [6 and 8].

° The phrase "weight of evidence" refers to the <u>strength of the evidence</u> that the substance causes cancer. Substances are classified into five "weight of evidence" groups [5]:

NOTE

Group A. Human carcinogen
Group B. Probable human carcinogen
Group C. Possible human carcinogen
Group D. Not classifiable
Group E. Evidence of noncarcinogenicity

° As of March, 1989, EPA has reviewed 34 experiments conducted to determine the carcinogenicity of lead to laboratory animals [5]. In 24 of these experiments, at least some evidence of carcinogenicity of lead and lead compounds was detected [5]. Although lead was most commonly administered in the food during these studies, positive results were also seen following administration via drinking water, intraperitoneal injection, subcutaneous injection, and skin painting [5]. Because of these results, lead is considered to be potentially carcinogenic by any route of exposure [5].

° Human studies on lead exposure have provided suggestive evidence of carcinogenicity, but, because of confounding exposures to other carcinogens during some of these studies, and the lack of measurements of lead exposure, the studies do not prove or disprove carcinogenicity in humans [5]. Even though the epidemiologic evidence for lead being a human carcinogen is considered inadequate, it is important to note that the evidence is thought to be "suggestive" [5]. In this case, "suggestive" means that the data are positive enough to "raise a concern about the human carcinogenicity of lead" [5]. Future well designed studies could elevate the human evidence to the "limited" or "sufficient" category or they could show negative findings which would support downgrading the classification [5]. In addition, numerous long-term animal studies, using several different forms of lead and routes of exposure, provide sufficient evidence [5]. This combination of evidence, together with information from short-term tests, other toxic effects, and pharmacokinetic properties, results in the classification of lead and lead compounds as probable human carcinogens, Group B2 [5].

NOTE

° In November of 1985, EPA classified lead as a Group B2 carcinogen (probable human carcinogen) according to the EPA Guidelines for Carcinogen Risk Assessment [3]. In addition, lead may act as a promotor or initiator of carcinogenesis and <u>in vitro</u> studies support the claim that lead is both genotoxic and carcinogenic [3].

NOTE

° No specific cancer potency has been estimated for lead and since it took relatively high concentrations of lead to increase the incidence of cancer in animals, it is probably appropriate to characterize the cancer potency of lead as low, relative to other carcinogens [5].

* When all the blood studies on lead-exposed workers are taken together, "there is a suggestion that lead is capable of increasing the frequencies of chromosomal aberrations in peripheral blood lymphocytes of exposed workers" [5]. These data support the "suggestive" epidemiologic cancer evidence for lead and lead compounds [5].

* Recent studies indicate that lead has "genotoxic" (mutagenic) properties [5]. Lead compounds may not directly damage genetic material; instead, they may act by an indirect mechanism(s) [5].

* Lead is a potential <u>mutagen</u> and <u>teratogen</u> [9 and 11].

* The EPA is proposing the lead MCLG at zero for drinking water because: a) the variety of low level effects for which it is difficult to clearly determine threshold blood levels below which there are <u>no</u> risks of adverse health effects; b) the agency's policy goal to minimize lead exposure from drinking water since "a substantial portion of the sensitive population already exceeds acceptable blood levels;" and c) the classification of lead as a Group B2 carcinogen.

* According to the "Green Book", the bioaccumulation tests conducted on the Oakland Inner Harbor sediments are intended to "assess the potential for the long-term accumulation of toxics in the food web to levels that might be harmful to the ultimate consumer, which is often man, without killing the intermediate organisms" [2]. In addition, "the environmentally protective assumption is made that a statistically significant effect in the solid phase bioassay indicates a real potential for environmental impact from the solid phase" and "bioaccumulation of any potentially harmful constituent, whether listed in Section 227.6 or not, could make the material undesirable for ocean dumping" [2].

* Section 227.6 of the Ocean Dumping Regulations specifically states that "Known carcinogens, mutagens, or teratogens or materials suspected to be carcinogens, mutagens, or teratogens by responsible scientific opinion" should not be dumped in the ocean unless they are present as "trace amounts" (§ 227.6 (a) (5), [1]). In addition, the constituents that are prohibited in Section 227.6 "will be considered to be present as trace contaminants only when they .... will not cause significant undesirable effects, <u>including the possibility of danger associated with their bioaccumulation in marine organisms</u>" (emphasis added) (§ 227.6 (b), [1]). The proper bioaccumulation test procedures, as described in § 227.6 (c) (3) and the "Green Book", were utilized in the Port of Oakland project and lead is definitely a known or suspected human carcinogen, mutagen and teratogen. Because of this, the bioaccumulation of lead in the clams exposed to sediments from the CH-1 and TD-2-1 stations indicates that these sediments <u>failed</u> both the "Green

Book" and Ocean Dumping Regulatory criteria developed to assist in determining whether or not dredged materials should be dumped in the ocean.

° It should be noted and emphasized that neither the "Green Book" [2] nor the Ocean Dumping Regulations [1] require EPA, or the Corps of Engineers, to use bioassay species that have been, or could be, consumed by humans. In fact, the "Green Book" states that if "at all possible, the test species should be collected from the area in which the reference substrate is collected. They should be the same species or closely related to those species that naturally dominant benthic assemblages in the vicinity of the disposal site in the season of the the proposed operation" [2]. Even though the animals used in the solid phase bioassays were not collected from the reference area (it was not possible to do so in large enough numbers), all three genera (i.e., Rhepoxynius (amphipod), Macoma (clam), and Nepthys (worm) are found "in the vicinity of the disposal site."

It should also be noted and emphasized that neither the "Green Book" [2] nor the Ocean Dumping Regulations [1] require EPA, or the Corps of Engineers, to specifically determine human consumption rates of any of the species that failed the bioaccumulation tests.

° The bioaccumlation tests conducted with the Oakland Inner Harbor sediments indicated that the sediments at stations TD-2-L and CH-1 contained bioavailble lead and stations TD-1(U&L) and TD-2(U&L) contained bioavailable tributyltin. As a result, EPA is concerned about the potential impact of these sediments in the vicinity of an ocean disposal site because of "Presence in the material of chemicals constituents which may be bioaccumulated or persistent and may have an adverse effect on humans directly or through food chain interactions" (§ 227.18 (g), [1]).

If you have questions or comments about my review, please let me know. Thanks!

cc: Janet Hashimoto
Patrick Cotter
Chris Sproul

ATTACHMENT F

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL RESEARCH LABORATORY
SOUTH FERRY ROAD
NARRAGANSETT, RHODE ISLAND 02882

September 28, 1990

MEMORANDUM

SUBJECT: Review of Pago Pago Harbor, American Samoa, Toxicity Study Report (dated August, 1990)

FROM: Brian D. Melzian, Ph.D.
Regional Oceanographer
Region IX/ERL-N

TO: Sheila Wiegman
Environmental Coordinator
American Samoa Environmental Protection Agency

As requested, I have reviewed all of the Pago Pago Harbor study results sent to Janet Hashimoto (San Francisco) on August 28, 1990, and the Autralian acceptable "levels in fish" table sent to me on September 12, 1990. The government of Samoa should be commended for designing and initiating this very important study. Overall, the study design appears to be adequate. However, there are some major deficiencies that should (must) be corrected before any future sampling and analyses begin. Below, please find my major comments, questions, suggestions, and conclusions in regards the August 1990 study report.

STUDY DESIGN (page 1 of the report)

1. *In addition to metals, perhaps TRIBUTYLTIN (TBT) should also be measured in sediments and fish collected near the ship yard. Why? A recent U.S. Navy study showed that one of the major sources of TBT in the estuarine/marine environment is ship yards that sandblast the hulls of ships previously painted with antifouling paint containing TBT. TBT is now known as the most toxic chemical ever deliberately introduced into the marine environment. In fact, the new WATER QUALITY CRITERION (WQC) for TBT, which may be published later this fall, will have WQC numbers in the low parts per trillion levels. Because of this, perhaps some water column samples should also be measured for TBT?*

2. *In regards potential "chemicals of concern" from the tuna canneries, I recommend that you peruse their NPDES permits to determine the metals and organic chemicals, etc. that are routinely discharged from the canneries. Perhaps some of these chemicals, in addition to the ones measured in the August study, should be measured in the water, sediments, and tissue samples.*

3. *What was the rationale for selecting the fish species to be monitored? Are they commonly found in the harbor? Are they ecologically important; and most importantly, are they consumed by HUMANS that catch the fish in the harbor, or catch the fish after they swim from the harbor? Detailed guidance on selection of fish species is found in the recently published EPA fish risk assessment document (please see page 6 of this memorandum). Finally, for legal and scientific reasons, it is very important that the SCIENTIFIC NAMES of all the fish collected and analyzed be recorded.*

4. *I suspect the MAIN REASON why PCBs, PAHs, and PESTICIDES were not detected in the sediment samples and/or fish samples was not because they were not present; rather, it probably was because of the ANALYTICAL METHODS EMPLOYED during the study: For example:*

   - *What were the METHOD DETECTION LIMITS for metals, pesticides, PCBs, and "HYDROCARBONS" measured in the water, sediment, and tissue samples?*

   - *Please find out why Aroclor® 1248 and Aroclor® 1254 were not measured in the sediment and tissue samples. Much previous work has shown that these two Aroclors, in addition to Aroclor® 1260, usually make up much (or most) of the PCBs ever detected in marine sediment or tissue samples. Was a packed column or a capillary column (much preferred) used to measure the PCBs (which are mixtures of the Aroclors)? Failure to measure Aroclors® 1248 and 1254 could result in seriously underestimating PCB concentrations in both the sediment and tissue samples.*

   - *What method(s) were used to measure "oil and grease" and "Total Petroleum Hydrocarbons?" I suspect that they were gravimetric or infrared, neither of which are suitable in studies of this type.*

   - *Depending on what you find out about the above questions, much of the data already collected may be useless, or they may be useful in a scientific and regulatory sense.*

   NOTE: Based on much experience, the above concerns and questions are usually the most problematical in studies of this nature. Why? The contractors or laboratories that do the work are usually used to: a) working in terrestrial environments; and b) using high method detection limits which are suitable for SUPERFUND or HAZARDOUS WASTE SITES, but are not suitable for analysis of estuarine/marine environmental samples.

STUDY FINDINGS TO DATE (page 2 of the report)

Seawater:

1) *Please NOTE that the water samples from Site 1 and Site 4 had metal concentrations that greatly exceeded the acute and*

chronic WQC for COPPER (both are 2.9 ppb) and the chronic WQC for LEAD (which is 5.0 ppb). Again, what were the METHOD DETECTION LIMITS used during the analysis of these ambient water samples? I know of many past cases where the detection limits of the methods used exceeded the WQC numbers.

2) The detection of "Total petroleum hydrocarbons" (TPH) at concentrations as high as 150 ppb (Site 1) and 250 ppb (Site 4) is very significant because much previous research (including my own) around the world has shown that concentrations as low as 10 ppb can (and do) chronically affect marine organisms. In clean tropical waters, I would expect the TPH concentrations to be much less than 50 ppb.

3) The statement that "Chromium is slightly below the criterium" is true. However, the statement that "No chronic marine criterium is available for copper (emphasis added), and the results are less than the acute marine criterium" is FALSE [Please see comment # 1), above].

Sediments:

1] I recommend that you review the list of "volatile organics" and "pesticides" measured in the sediments. Did anyone determine the potential sources of agricultural/domestic/industrial pesticides entering the harbor? If this was done, were these pesticides added to the list? If not, why not?

2] Please note my earlier comment about the inadequacy of only measuring Aroclor® 1260. Measurement of a selected list of PCB CONGENERS, of which there are 209 different types, could have (should have) been required.

3] PCB concentrations as high as 1.5 - 2.0 ppm in sediments (Sites 3,4, and 5) are significant; and yes, I would expect these compounds to be detected in demersal fish that inhabitated those sites.

4] COPPER AND LEAD were definitely elevated at Sites 3 and 4, and LEAD was elevated at Site 6. Note that the WQC for COPPER AND LEAD were exceeded at Sites 1 and 4 (see earlier comment). Also note the very high concentration of SILVER at Site 6. Is this a real number? If yes, perhaps a source of this toxic metal should be looked for.

5] Levels of "oil and grease" as high as 2,000 to 7,000 mg/kg (ppm) are VERY SIGNIFICANT because PAHs and other known or potential carcinogens are usually found in "oil and grease." Recent research has indicated that occurrence of liver neoplasms in demersal fish are correlated with the amount and type of PAHs found in the sediments, especially if the TOTAL PETROLEUM HYDROCARBON (TPH) concentrations exceed a level of approximately 5 ppm. Are you sure that the concentraton units reported are mg/kg (ppm) versus ug/kg (ppb)? If the reported numbers are real, these sediments may be grossly contaminated with "oil and grease" and/or TPH. What were the TPH concentrations in these sediments?

Fish Tissue:

(1) *It is not clear from the data presented what species of fish were composited and analyzed to make up the data found in the liver and muscle table (page 4 of the report). In addition, what do the numbers at the top of the table represent (i.e., 1, 5, 7, 8, and 9)? Are these Site identification numbers, or do they represent the sample composite number?*

(2) *In order to help interpret these data, and to determine if these data are of high quality, it is important to know the following:*

a) *The exact location where each fish species was collected. Were any fish collected from known CONTROL OR REFERENCE Sites to determine "background" levels? Failure to collect and measure the same species collected from clean CONTROL or REFERENCE Sites is a major DEFICIENCY of the August study, and should (must) be corrected in any future study;*

b) *The total number of fish that made up each composite sample, and the scientific justification and rationale for the compositing scheme used;*

c) *How (and when) the fish tissues (liver and muscle) were resected (removed) from each fish, stored before analysis (i.e., what temperature), and the EXACT ANALYTICAL PROCEDURES (including METHOD DETECTION LIMITS) used to measure:*

- *Polynuclear Aromatic Hydrocarbons (PAHs);*
- *PCBs;*
- *Pesticides; and*
- *Metals [for example, was hexavalent or trivalent chromium (preferred) measured?]*

d) *As stated earlier, I suspect that the primary reason why PCBs PAHs, and perhaps pesticides were not detected in the tissues was because of the analytical methods employed. Please prove me wrong on this point.*

(3) *To me, the samples (or sites) that appeared to have the most important FISH METAL CONTAMINATION problems include the following:*

LIVER: # 7 (CHROMIUM, COPPER, and LEAD); and # 8 (CHROMIUM and LEAD)

MUSCLE: # 2 (CHROMIUM, LEAD and MERCURY), # 3 (CHROMIUM, LEAD and MERCURY), and # 7 (CHROMIUM, COPPER, AND LEAD)

(4) *Note my earlier comments about LEAD being found at elevated levels in WATER, SEDIMENTS, AND NOW TISSUES.*

NOTE: During the Port of Oakland dredging case, I did an extensive literature search on the toxicolgical importance of LEAD and concluded that:

- *Aquatic sediments are not only "sinks" for lead, they may also act as sources of lead to aquatic biota long after contamination from the original source(s) has subsided [this also applies to other metals and organic compounds (e.g., PCBs, TBT)]; and*
- *In November of 1985, EPA formally classified LEAD as a Group B2 carcinogen (probable human carcinogen) according to the EPA Guidelines for Carcinogen Risk Assessment. In addition, lead may act as a promoter or initiator of carcinogenesis and in vitro studies support the claim that lead is both genotoxic and carcinogenic.*

Would you eat these fish?

DISCUSSION OF PRELIMINARY RESULTS (page 4 of the report)

Seawater: I concur with the discussion found in the document sent to me, and please refer to my above comments.

Sediments: In general, I concur with the discussion in the document, but also note my previous comments. In particular, please note my comments on TBT, Aroclors®, AND TOTAL PETROLEUM HYDROCARBONS. It appears that many of the sediments are grossly contaminated, and the chemicals in them are potentially bioavailable because most of the sediment samples consisted of fine and very fine SANDS. Only Sites 3D and Site 4 had sediments that were mainly SILT/CLAY. As you may know, much research has shown that the SILT/SIZE fraction usually contains (and holds) the most contaminants (especially the organic chemicals), as compared to the fine sands, etc.

Fish Tissue: Please see all of my earlier comments about the potential detection limit problems, elevated LEAD concentrations, etc. After comparing the "Range Fish Livers (spp. comb.)," found in the Table found on page 5 of the report, with the MEDIAN INTERNATIONAL LIMITS (which I have in my possession) for metals, It appears that both CHROMIUM and LEAD are "chemicals of concern." The median international limit for chromium is 1.0 ppm, and the median international limit for lead is 2.0 ppm. PLEASE NOTE, HOWEVER, THAT THESE INTERNATIONAL LIMITS HAVE NO LEGAL AUTHORITY IN THE UNITED STATES. Only the FDA "Action Levels" have regulatory authority in the U.S. If desired, I can provide more information on this topic. Also note the discussion on FDA Action Levels found in the document referenced on page 6 of this memorandum.

Even though I realize that an honest and objective attempt was made to derive and utilize the "Relative Index of Badness," I STRONGLY RECOMMEND that it not be used in the future. It is totally inappropriate to treat "all metals equally." Why? Metals can and do vary dramatically in their acute and chronic toxicity, and in their "Reference Dose" (RfD) values. Since it has long been known that most metals do not BIOMAGNIFY through the food web (except mercury, and possibly lead), it is not surprising to me that the fish exposed to the sediments had the highest metal concentrations.

Problems and Further Information Needed (page 6 of the report)

I. Please refer to all of my above comments; and

II. PCBs are of major concern, and future studies should use the appropriate analytical methods to measure the types and amounts of PCBs [Congeners (preferred) or Aroclors] found in sediments, and fish tissue (especially the muscle). If possible, all contaminant concentrations in fish tissue should be normalized to TISSUE LIPID CONCENTRATIONS;

III. In order to determine the potential BIOAVAILABILITY of the METALS found in the sediments, it is recommended that ACID VOLATILE SULPHIDES (AVS) and SIMULTANEOUSLY EXTRACTED METALS (SEM) be measured in at least some of the sediments collected in the future. In addition, knowledge of the TOTAL ORGANIC CARBON (TOC) concentrations in the sediments is very important in determining the potential bioavailability of ORGANIC CHEMICALS. This laboratory could provide guidance in the collection, storage, and analytical procedures that should be used to measure AVS, SEM, and TOC;

IV. HEXAVALENT CHROMIUM, LEAD, and perhaps MERCURY (see earlier comment) are major metals of concern; so much so that issuance of a health advisory may be warranted (see below);

V. In order to properly design and implement any future FISH RISK ASSESSMENT STUDY, I strongly recommend that the following document be consulted:

- ASSESSING HUMAN HEALTH RISKS FROM CHEMICALLY CONTAMINATED FISH AND SHELLFISH: A GUIDANCE MANUAL (EPA-503/8-89-002):
  - This document was published in September 1989; and
  - Please call or FAX Ms. Margherita Pryor (EPA HQ: Office of Marine and Esutarine Protection) to receive copies of this document:

PHONE: (202) 475-7176
FAX: (202) 245-3960

VI. *In general, I agree with the analysis provided by the "Great Barrier Reef Marine Park Authority," with one notable exception; namely, note the VERY HIGH MERCURY concentrations found in fish MUSCLE samples # 2 and # 3 (page 4 of the report)*

If you have any questions or comments about my review, please call me at (401) 782-3163, or FAX a message to me. Thanks!

cc: Janet Hashimoto (Region IX)
Norm Lovelace (Region IX)

Norbert Jaworski (ERL-N)
Don Phelps (ERL-N)
Jerry Pesch (ERL-N)
Dave Hansen (ERL-N)

AMERICAN SAMOA GOVERNMENT
PAGO PAGO, AMERICAN SAMOA 96799
OFFICE OF THE GOVERNOR
ENVIRONMENTAL PROTECTION AGENCY

In reply refer to:
Serial: 403

August 28, 1990

Janet Hashimoto
Oceans and Estuaries Branch
U.S. Environmental Protection Agency
Region 9
1235 Mission Street
San Francisco, California 94105

Dear Janet:

Attached is a description and results of a toxicity study recently completed in Pago Pago Harbor, American Samoa. I would appreciate your assistance in review of this data, recommendations on additional resource documents, and suggestions for further study, if warranted. You can contact me at (684) 633-2304 or fax (684) 633-5801. Thank you.

Sincerely,

Sheila Wiegman
Environmental Coordinator
American Samoa Environmental
Protection Agency

Attachment:

cc: Pat Young, USEPA

MELZIAN

ATTACHMENT E

United States
Environmental Protection
Agency

Office of Water
Regulations and Standards
Washington, DC 20460

December 1983

Water

EPA

Water Quality Standards Handbook

FOREWORD

The Water Quality Standards Handbook contains the guidance prepared by EPA to assist States in implementing the revised Water Quality Standards Regulation (48 F.R. 51400, November 8, 1983). Changes in this Handbook may be made from time to time reflecting State/EPA experience in implementing the revised Regulation. The Handbook is organized to provide a general description of the overall standards setting process followed by information on general program administrative policies and procedures, and then a description of the analyses used in determining appropriate uses and criteria.

The Clean Water Act established two types of regulatory requirements to control pollutant discharges: technology-based effluent limitations which reflect the best controls available considering the technical and economic achievability of those controls; and water quality-based effluent limitations which reflect the water quality standards and allowable pollutant loadings set by the States (with EPA oversight).

Technology-based requirements for dischargers are currently being issued. However, in some cases these controls will not be sufficient to eliminate water quality impacts and enable water quality standards to be met. In these cases, water quality-based controls are needed. Two technical approaches are available for developing WQ-based effluent limits, the pollutant-specific approach and the biomonitoring approach. Pollutant-specific techniques are best used where discharges contain a few, well-quantified pollutants and the interactions and effects of the pollutants are known. In addition, pollutant-specific techniques should be used where health hazards are a concern or bioaccumulation is suspected.

It may be difficult, however, in some situations to determine attainment or nonattainment of water quality standards and set appropriate limits because of complex chemical interactions which affect the fate and ultimate impact of toxic substances in the receiving water. In many cases, all potentially toxic pollutants cannot be identified by chemical methods. Also, developing numerical water quality criteria and determining allowable loadings for all of the wide variety of pollutants found in effluents would be very time-consuming and resource intensive. In such situations, it is more feasible to examine overall toxicity and instream impacts using biological methods rather than attempting to identify all toxic pollutants, determining the effects of each pollutant individually, and then attempting to assess their collective effect.

Therefore EPA has developed a two-fold approach to toxics control. In certain situations we must still rely upon the chemical-specific approach, measuring individual toxicants and evaluating their specific toxic properties. In other situations, especially where complex effluents are involved, it is more appropriate to examine the harmful effects of toxicity of the whole effluent rather than attempt to identify individual toxicants and understand their chemical interaction. This second approach relies on newly-developed biological monitoring methods and laboratory testing procedures.

We expect to continue to build the necessary EPA expertise in the area of biomonitoring and work together with other interested groups over the next several years to develop a balanced and integrated biological/chemical-specific approach to developing realistic water quality-based permit limitations.

The purpose of this guidance document is to illustrate the types of scientific and technical data and analyses EPA believes are necessary to be conducted so that the public and EPA can review decisions on water quality standards affecting water quality limited segments, i.e. those water bodies where standards cannot be met even with the implementation of the technology-based controls required by the Act (secondary treatment for municipalities and best available/best conventional treatment for industries).

When a State conducts use attainability analyses or establishes appropriate criteria, EPA is not requiring that specific approaches, methods or procedures be used. Rather, States are encouraged to consult with EPA early in the process to agree on appropriate methods before the analyses are initiated and carried out. States will have the flexibility of tailoring the analyses to the specific water body being examined as long as the methods used are scientifically and technically sound.

State pollution control agencies are encouraged to solicit the assistance of other State agencies, municipalities, industry, environmental groups, and the community-at-large in collecting the data for the analyses. By carefully outlining quality assurance/quality control procedures States can assure the integrity and validity of the data for the analyses, while easing the resource burdens.

A State must conduct and submit to EPA a use attainability analysis where the State designates or has designated uses that do not include the uses specified in Section 101(a)(2) of the Act, or when a State wishes to remove a designated use that is specified in the goals or to adopt subcategories of uses requiring less stringent criteria. A State must adopt criteria sufficient to protect the designated uses. In adopting criteria, States may use Section 304(a) criteria or set site-specific criteria. Analyses conducted in support of revisions to standards are subject to EPA review.

A use attainability analysis is a multi-step scientific assessment of the physical, chemical, biological and economic factors affecting the attainment of a use. In preparing a use attainability analyses, a water body survey and assessment is conducted to examine the physical, chemical and biological characteristics of the water body. This assessment identifies and defines the existing uses of that water body, determines whether the designated uses are impaired, and the reasons for the impairment. By comparing the water body with one that is not impaired by man-induced pollution and with similar physical characteristics, the assessment assists States in projecting the potential uses that the water body could support in the absence of pollution. The next step in a use attainability analysis is a waste load allocation which utilizes mathematical models to predict the amount of reduction in pollutant loadings necessary to achieve the designated use. After determining the technology needed to meet these effluent reductions, an economic assessment may be conducted to determine whether requiring more stringent technology than that mandated by the Act will cause widespread and substantial economic and social impact.

A State may adopt EPA recommended criteria without any analysis or justification. However, EPA's laboratory-derived criteria may not always accurately reflect the toxicity of a pollutant in a particular water body because of differences in temperature, pH, etc. A State may choose to set site-specific criteria based on characteristics of the local water body. Setting site-specific criteria is also appropriate in water bodies with different species than those used in the derivation of the Section 304(a) criteria or where adaptive processes have enabled a viable, balanced community to exist with levels of pollutants that exceed the national criteria.

Any questions on this guidance may be directed to the water quality standards coordinators located in each of the EPA regional offices or to:

David Sabock
U.S. Environmental Protection Agency
Chief, Criteria Branch (WH-585)
401 M Street, S.W.
Washington, D.C. 20460
(Telephone 202-245-3042)

EPA sincerely appreciates the efforts of the many people and organizations who participated in the public review of the water quality standards program regulation and guidance since their proposal in October 1982.

Steven Schatzow

Steven Schatzow, Director
Water Regulations and Standards

CHAPTER 4

GUIDELINES FOR DERIVING SITE-SPECIFIC WATER QUALITY CRITERIA

Contents

Purpose and Application

The purpose of these guidelines is to provide guidance for the development of water quality criteria which reflect local environmental conditions. These site-specific criteria may be utilized as a basis for establishing water quality standards to protect the uses of a specific water body.

Water quality criteria must be based on a sound scientific rationale in order to protect a designated use. EPA is not advocating that States use site-specific criteria development procedures for setting all criteria as opposed to using the national Section 304(a) criteria recommendations.1/ Site-specific criteria are not needed in all situations. When a State considers the possibility of developing site-specific criteria, it is essential to involve the appropriate EPA office at the start of the project so that agreement can be reached concerning data currently available, additional data needs, the best source for generating the new data, the best testing procedure to be used, the schedule to be followed, and quality control and quality assurance provisions. This early planning is also essential if it appears that the data generation and testing may be conducted by a party other than the State or EPA. The State and EPA need to apply the procedures judiciously and must consider the complexity of the problem and the extent of knowledge available concerning the fate and effect of the pollutant under consideration. If site-specific criteria are developed without early involvements of EPA in the planning and design of the task, the State may expect EPA to closely scrutinize the results before granting any approval to the formally adopted standards.

The procedures described in this chapter represent the first attempts at describing acceptable methods for developing site-specific criteria. EPA will be monitoring their implementation and developing additional procedures in the future. These procedures periodically will be revised to reflect field experiences and additional research.

1/ National water quality criteria for toxic pollutants were published as guidance under Section 304(a) of the Clean Water Act, Nov. 28, 1980, (45 FR 79318). Site-specific criteria are criteria that are intended to be applicable to a given localized site.

Rationale

National water quality criteria for aquatic life may be underprotective or unnecessarily stringent if: (1) the species at the site are more or less sensitive than those included in the national criteria data set or (2) physical and/or chemical characteristics of the site alter the biological availability and/or toxicity of the chemical. Therefore, it is appropriate that the individual Site-Specific Guidelines procedures address each of these conditions separately, as well as the combination of the two. Table 1 lists the chemicals for which national criteria are presently available.

Site-specific critera development may be justified because species at a given site may be more or less sensitive than those represented in the national criteria document. For example, the national criteria data set contains data for trout, salmon, penaeid shrimp, and other aquatic species that have been shown to be especially sensitive to some materials. Because these or other sensitive species may not occur at a particular site, they may not be representative of those species that do occur there. Conversely, there may exist at a site, untested sensitive species that are ecologically important and would need to be protected.

In addition, differences in physical and chemical characteristics of water have been demonstrated to ameliorate or enhance the biological availability and/or toxicity of chemicals in freshwater and saltwater environments. Alkalinity, hardness, pH, suspended solids and salinity influence the concentration(s) of the toxic form(s) of some heavy metals, ammonia, and other chemicals. For some chemicals, hardness or pH-dependent national criteria are available for freshwater. No salinity-dependent criteria have been derived because most of the saltwater data for heavy metals has been developed in high salinity waters. However, in some estuarine sites where salinity may vary significantly, the development of salinity-dependent site-specific criteria may be appropriate.

The effect of seasonality on the physical and chemical characteristics of water and subsequent effects on biological availability and/or toxicity of a chemical may also justify seasonally dependent site-specific criteria. The major implication of seasonally dependent criteria is whether or not the "most sensitive" time of the year coincides with that time for which the flow is the basis for waste treatment facilities design or NPDES permits. That is, if the physical and chemical characteristics of the water during low flow seasons increases the biological availability and/or toxicity of the chemical of concern, the permit limitations may be more restrictive than if the converse relationship were to apply.

TABLE 1

FRESHWATER AND SALTWATER NATIONAL CRITERIA LIST

(x = criteria are available)

(0 = criteria will be available in 1984)

Chemical	Freshwater	Saltwater
Aldrin	x	x
Ammonia	x	-
Dieldrin	x	x
Chlordane	x	x
DDT	x	x
Endosulfan	x	x
Endrin	x	x
Heptachlor	x	x
Lindane	x	x
Toxaphene	x	x
Arsenic(III)	x	0
Cadmium	x	x
Chlorine	x	x
Chromium(VI)	x	x
Chromium(III)	x	-
Copper	x	x
Cyanide	x	0
Lead	x	0
Mercury	x	x
Nickel	x	x
Selenium(IV)	x	x
Silver	x	x
Zinc	x	x

Definition of Site

Since the rationale for the Site-Specific Guidelines is usually based on potential differences in species sensitivity, physical and chemical characteristics of the water, or a combination of the two, the concept of site must be consistent with this rationale.

A site may be limited to that area affected by a single point source discharge or can be quite large. If water quality effects on toxicity are not a consideration, the site will be as large as a generally consistent biogeographic zone permits. In this case, for example, large portions of the Chesapeake Bay, Lake Michigan, or the Ohio River may each be considered as one site because their respective aquatic communities may not vary substantially. Unique populations or less sensitive uses within sites may justify a designation as a distinct site (subsite). When sites are large, the necessary data generation can be more economically supportable.

If the selected species of a site are toxicologically comparable to those species in the national criteria data set for a material of interest, and physical and/or chemical water characteristics are the only factors supporting modification of the national criteria, then the site would be defined on the basis of expected changes in the material's biological availability and/or toxicity due to physical and chemical variability of the site water.

Two additional considerations in defining a site are: 1) viable communities must occur, or be historically documented, in order to select resident species for use in deriving site-specific criteria, and 2) the site must contain acceptable quality dilution water if site water will be required for testing (to be discussed later in these Guidelines).

For the purpose of the Site-Specific Guidelines, the term "selected resident species" is defined as those species that commonly occur in a site including those that occur only seasonally (migration) or intermittently (periodically returns or extends its range into the site). It is not intended to include species that were once present in that site and cannot return due to physical habitat alterations.

Selection of a resident species should be designed to account for differences between the sensitivities of the selected resident species and those in the national data set. There are several possible reasons for this potential difference. The principal reason is that the resident communities at a site may represent a more or less narrow mix of species due to a limited range of natural environmental conditions (e.g., temperature, salinity, habitat, or other factors affecting the spatial distribution of aquatic species). The number of resident species will generally decrease as the size of the site decreases.

A second potential reason for a real difference in sensitivity could be the absence of most of the species or groups of species (e.g., families) that are traditionally considered to be sensitive to certain, but not all, chemicals (e.g., trout, salmon, saltwater penaeid shrimp, and Daphnia magna). Predictive relative species sensitivity does not apply to all materials, and the assumption that sensitive species are unique rather than representative of equally sensitive untested species is tenuous. A final reason could be that the resident species may have evolved a genetically based greater resistance to high concentrations of a material, but no data have been presented to demonstrate such a genetic difference. A few instances of increased resistance have been suggested but may be due to an acclimation of individual organisms to a stream. However, such an acclimation, should it occur, would be transitory.

Assumptions

There are numerous assumptions associated with the Site-Specific Guidelines which also apply to and have been discussed in the National Guidelines. A few need to be emphasized. The principal assumption is that the species sensitivity ranking and toxicological effect end points (e.g., death, growth, or reproduction) derived from appropriate laboratory tests will be similar to those in site situations. Another assumption is that the protection of all of the site species all of the time is not necessary because aquatic life can tolerate some stress and occasional adverse effects.

Another assumption of the Site-Specific Guidelines which follows directly from the National Guidelines is that criteria should be developed to protect the use of aquatic organisms, as well as the organisms themselves. For example, some of the national criteria were developed specifically to protect aquatic organisms from accumulating tissue residue levels of toxics which would harm wildlife predators or exceed FDA action levels. The Site-Specific Guidelines have provided procedures which enable such criteria to be adjusted to reflect local considerations, such as the fat content of resident species.

It is assumed that the Site-Specific Guidelines are an attempt to more correctly protect the resident aquatic life by accounting for toxicological differences in species sensitivity and/or water quality at the sites. Modification of the national biological data base and use of bioassay data obtained on resident species in either laboratory or site water must always be scientifically justifiable and consistent with the assumptions, rationale, and spirit of the National Guidelines.

Site-specific and national criteria are not intended or assumed to be enforceable numbers. The criteria may be used by the States to develop enforceable water quality standards and/or water quality based effluent limits. The development of standards or limits should also take into account additional factors such as the use of the site, as well as social, legal, economic, and institutional considerations. Many factors may impact the site, the environmental and analytical chemistry of the chemical, the extrapolation from laboratory data to field situations, and the relationship between the species for which data are available and the species in the body of water which is to be protected.

Procedures

° Summary

There are three procedures described in these Site-Specific Guidelines for developing site-specific criteria. The procedures for the derivation of a site-specific criterion are:

A. The recalculation procedure to account for differences in resident species sensitivity to a chemical.

B. The indicator species procedure to account for differences in biological availability and/or toxicity of a chemical caused by physical and/or chemical characteristics of a site water.

C. The resident species procedure to account for differences in resident species sensitivity and differences in the biological availability and/or toxicity of a chemical due to physical and/or chemical characteristics of a site water.

The following is the sequence of decisions to be made before any of the above procedures is initiated:

1) Define the site boundaries.

2) Determine from the national criterion document and other sources if physical and/or chemical characteristics are known to affect the biological availability and/or toxicity of the material of interest.

3) If data in the national criterion document and/or from other sources indicate that the range of sensitivity of the selected resident species to the material of interest is different from that range for the species in the national criterion document and variation in physical and/or chemical characteristics of the site water is not expected to be a factor, use the recalculation procedure (A).

4) If data in the national criterion document and/or from other sources indicate that physical and/or chemical characteristics of the site water may affect the biological availability and/or toxicity of the material of interest, and the resident species range of sensitivity is similar to that for the species in the national criterion document, use the indicator species procedure (B).

5) If data in the national criterion document and/or from other sources indicate that physical and/or chemical characteristics of the site water may affect the biological availability and/or toxicity of the material of interest, and the resident species range of sensitivity is different from that for the species in the national criterion document, use the resident species procedure.

Recalculation Procedure

° Definition .

The recalculation procedure allows modifications in the national acute toxicity data set on the basis of eliminating data for species that are not resident at that site. When the elimination of data for this recalculation procedure for the site-specific Final Acute Value results in not meeting the national minimum data set requirements, additional resident species acute testing in laboratory water is required before this procedure can be used.

° Rationale

This procedure is designed to compensate for any real difference between the sensitivity range of species represented in the national data set and species found at a site.

° Conditions

- If acute toxicity data for resident species are insufficient to meet the minimum data set requirements of the National Guidelines, additional acute toxicity data in laboratory water for untested resident species would be needed before a calculation of the site-specific criterion could be made.

- Certain families or organisms have been specified to be represented in the National Guidelines acute toxicity minimum data set (e.g., Salmonidae in freshwater and Penaeidae or Mysidae in saltwater). If this or any other requirement cannot be met because the family or other group (e.g., insect or benthic crustacean in freshwater) is not represented by resident species, select a substitute(s) from a sensitive family represented by one or more resident species and meet the 8 family minimum data set requirement. If all the families at the site have been tested and the minimum data set requirements have not been met use the most sensitive resident family mean acute value as the site-specific Final Acute Value.

- Due to the emphasis this procedure places on resident species testing when the minimum data set has not been met, there may be difficulty in selecting resident species compatible to laboratory testing. Some culture and/or handling techniques may need to be developed.

- No chronic testing is required by this procedure since the national acute-chronic ratio will be used with the site-specific Final Acute Value to obtain the site-specific Final Chronic Value.

- For the lipid soluble chemicals whose national Final Residue Values are based on Food and Drug Administration (FDA) action levels, adjustments in those values based on the percent lipid content of resident aquatic species is appropriate for the derivation of site-specific Final Residue Values.

- For lipid soluble chemicals, the national Final Residue Value is based on an average 11 percent lipid content for edible portions for the freshwater chinook salmon and lake trout and an average of 10 percent lipids for the edible portion for saltwater Atlantic herring. Resident species of concern may have higher (e.g., Lake Superior siscowet, a race of lake trout) or lower (e.g., many sport fish) percent lipid content than used for the national Final Residue Value. An adjustment for these differences may be necessary.

- For some lipid soluble chemicals such as polychlorinated biphenyls (PCB) and DDT, the national Final Residue Value is based on wildlife consumers of fish and aquatic invertebrate species rather than an FDA action level because the former provides a more stringent residue level (see National Guidelines for details). Since the data base on the effects of ingested aquatic organisms on wildlife species is extremely limited, it would be inappropriate to base a site-specific Final Residue Value on resident wildlife species. Consequently, site-specific modifications for those chemicals is based on percent lipid content of resident species consumed by humans.

- For the lipid soluble chemicals whose national Final Residue Values are based on wildlife effects, the limiting wildlife species (mink for PCB and brown pelican for DDT) are considered acceptable surrogates for resident avian and mammalian species (e.g., herons, gulls, terns, otter, etc.). Conservatism is appropriate for those two chemicals, and no less restrictive modification of the national Final Residue Value is appropriate. The site-specific Final Residue Value would be the same as the national value.

° Details of Procedure

- If the minimum data set requirements are met as defined in the National Guidelines or through substitution of one or more sensitive resident family(ies) for non-resident family(ies) or group(s) required in the National Guidelines, calculate a site-specific Final Acute Value using all available resident species data in the national document and/or from other sources. If all the families at the site have been tested and the minimum data set requirements have not been met, use the most sensitive resident family mean acute value as the site-specific Final Acute Value.

- If the minimum data set requirements are not met, satisfy those requirements with additional testing of resident species in laboratory water.

- If all species in a family at the site have been tested, then their Species Mean Acute Values should be used to calculate the site-specific Family Mean Acute Value and data for non-resident species in that family should be deleted from the calculation. If all resident species in that family have not been tested, the site-specific Family Mean Acute Value would be the same as the national Family Mean Acute Value.

- To derive the site-specific maximum concentration divide the site-specific Final Acute Value by 2, as prescribed in the National Guidelines.

- Divide the site-specific Final Acute Value by the national Final Acute-Chronic Ratio to obtain the site-specific Final Chronic Value.

- When a site-specific Final Residue Value can be derived for lipid soluble chemicals controlled by FDA action levels, the following recalculation equation would be used:

site-specific Final Residue Value =

$$\frac{\text{FDA action level}}{(\text{mean normalized BCF from criterion document})\ (\text{appropriate \% lipids})}$$

where the appropriate percent lipid content is based on consumed resident species. A recommended method to determine the lipid content of tissues is given in Appendix A.

- For PCB and DDT whose national Final Residue Values are based on wildlife consumers of aquatic organisms, no site-specific modification procedure is appropriate.

- In the case of mercury (a non-lipid soluble material), a site-specific Final Residue Value can be derived by conducting acceptable bioconcentration tests with edible aquatic resident species using accepted test methods given in Appendix A. For a saltwater residue value, a bivalve species is required, (the oyster is preferred) and for a freshwater value, a fish species is required. These taxa yield the highest known bioconcentration factors for metals. The following recalculation equation would be used:

site-specific Final Residue Value =

$$\frac{\text{FDA action level}}{\text{site-specific BCF}}$$

- The lower of either the site-specific Final Chronic Value and the site-specific Final Residue Value becomes the site-specific maximum 30-day average concentration unless plant or other data indicate that a lower value is appropriate.

° Limitations

- Whatever the results of this recalculation procedure may be, a decision should be made as to whether the numerical differences, if any, are sufficient to warrant changes in the national criterion.

- The number of families used to calculate any Final Acute Value significantly affects that value. Even though the four lowest Family Mean Acute Values (most sensitive families) are most important in that calculation, the smaller N (total number of families) is, the lower the Final Acute Value. Consequently, if none of the four most sensitive families are changed or deleted, any reduction in N will result in a lower Final Acute Value. Changes in or deletions of any of the four lowest values, regardless of whether N is changed, may result in a higher or lower Final Acute Value.

- Site-specific or national Final Residue Values based on FDA action levels may not precisely protect aquatic life, since the FDA action levels are adverse (i.e., loss of marketability).

- Bioaccumulation, except in field studies, does not add to the laboratory-derived bioconcentration factors because the laboratory procedures preclude food chain uptake. Consequently, some residue levels obtained by laboratory studies of bioconcentration (direct uptake of the chemical from water) may underestimate potential effects encountered at a site. The magnitude of site-specific bioconcentration factors obtained in the laboratory, therefore, may be insufficient to protect the public from the effects of the ingested chemical of concern.

Indicator Species Procedure

° Definition

This procedure is based on the assumption that physical and/or chemical characteristics of water at a site may influence biological availability and/or toxicity of a chemical. Acute toxicity in site water and laboratory water is determined using species resident to the site, or acceptable non-resident species, as indicators or surrogates for species found at the site. The difference in toxicity values, expressed as a water effect ratio, is used to convert the national maximum concentration for a chemical to a site-specific maximum concentration from which a site-specific Final Acute Value is derived.

This procedure also provides three ways to obtain a site-specific Final Chronic Value. It may be (1) calculated (no testing required) if a Final Acute-Chronic Ratio for a given chemical is available in the national criteria document. This ratio is simply divided into the site-specific Final Acute Value to obtain the site-specific Final Chronic Value; (2) obtained by performing two acute and chronic toxicity tests which include both a fish and invertebrate species (resident or non-resident) in site water. Acute-chronic ratios are calculated for each species, and the geometric mean of these ratios is then divided into the site-specific Final Acute Value to obtain the site-specific Final Chronic Value; and (3) obtained by performing chronic toxicity tests with at least one fish and one invertebrate (resident or non-resident) in both laboratory water and site water and calculating a geometric mean chronic water effect ratio which is used to modify the national Final Chronic Value.

° Rationale

This procedure is designed to compensate for site water which may affect the biological availability and/or toxicity of a chemical. Major factors affecting aquatic toxicity values of many chemicals, especially the heavy metals, have been identified. For example, the carbonate system of natural waters (pH, hardness, alkalinity, and carbon dioxide relationships) has been the most studied and quantified with respect to effects on heavy-metal biological availability and/or toxicity in freshwater. The literature indicates that in natural systems organic solutes, inorganic and organic colloids, salinity, and suspended particles also play an important but less quantifiable role in the biological availability and/or toxicity of heavy metals to aquatic life. This procedure provides a means of obtaining a site-specific Final Chronic Value for a chemical when the acute-chronic ratios in the national criteria document are thought to be inapplicable to site-specific situations.

° <u>Conditions</u>

- There is no reason to suspect that the resident species sensitivity is different from those species in the national data set.

- The toxic response seen in the tests used in the development of the national water quality criterion would be essentially the same if laboratory test water required in this procedure had been used instead.

- Differences in the toxicity values of a specific chemical determined in laboratory water and site water may be attributed to chemical (e.g., complexing ligands) and/or physical (e.g., adsorption) factors that alter the biological availability and/or toxicity of the chemical.

- Selected indicator species directly integrate differences in the biological availability and/or toxicity of a chemical. They provide a direct measure of the capacity of a site water to increase or decrease toxicity values relative to values obtained in laboratory water.

- National Final Acute-Chronic Ratios for certain chemicals can be used to establish site-specific Final Chronic Values.

- A site-specific acute-chronic ratio, obtained in site water testing, reflects the integrated effects of the physical and/or chemical characteristics of water on toxicity values.

- The water effect ratio concept used in this procedure for modifying national Final Acute Values to site-specific situations is also applicable to modifying national Final Chronic Values to site-specific situations.

° <u>Details of Procedure</u>

- Test at least two indicator species, a fish and an invertebrate, using laboratory dilution water and site dilution water according to acute toxicity test procedures recommended in Appendix A. Test organisms must be drawn from the same population and be tested at the same time and most importantly, except for the water source, be tested under identical conditions (i.e., temperature, lighting, etc.). The concentration of the chemical in the acute toxicity tests must be measured and be within the solubility limits of the chemical. Therefore, species selected for testing should be among the more sensitive to the chemical of interest.

- Compare the laboratory and site water LC50 values for each indicator species to determine if they are significantly different ($P \leq 0.05$) (see statistical procedure in Appendix B). If the LC50 values are not different, then the national maximum concentration is the site-specific maximum concentration. If the LC50 values are different, calculate the water effect ratio for each species according to the following equation:

  $$\text{Water Effect Ratio} = \frac{\text{Site Water LC50 Value}}{\text{Laboratory Water LC50 Value}}$$

  Determine if the two ratios are statistically different ($P \leq 0.05$) (see Appendix B).

  If the two ratios are not statistically different calculate the geometric mean of the water effect ratios. The site-specific maximum concentration can be calculated by using this geometric mean water effect ratio in the following equation: site- specific maximum concentration = water effect ratio x the national maximum concentration (or x the national maximum concentration adjusted to a water characteristic of the laboratory water when appropriate).

  If the two ratios are different, additional tests may have to be conducted to confirm or refute the data. In such cases professional judgment is appropriate in determining if some or none of the ratio data can be used to modify the national maximum concentration.

  The site-specific maximum concentration is multiplied by the 2 to obtain the site-specific Final Acute Value which is used to calculate the site-specific Final Chronic Value.

- If the national Final Acute-Chronic Ratio for the chemical of interest was used to establish a national Final Chronic Value, the site-specific Final Chronic Value may be calculated using the acute-chronic ratio in the following equation:

  Site-Specific Chronic Value =

  $$\frac{\text{Site-Specific Acute Value}}{\text{Final Acute/Chronic Ratio}}$$

- If the national Final Acute-Chronic Ratio was not used to establish a national Final Chronic Value, the national Final Chronic Value may be used as the site-specific Final Chronic Value, or it may be measured by performing 2 acute and 2 chronic tests, (Appendix A) using site water. Test at least one fish and one invertebrate species, and conduct using site water of similar quality. These data are used to calculate an acute-chronic ratio for each species. If these ratios are within a factor of 10, the geometric mean of the 2 acute-chronic ratios (the site-specific Final Acute-Chronic Ratio) is used to calculate the site-specific Final Chronic Value using the following equation:

$$\text{Site-Specific Final Chronic Value} = \frac{\text{Site-Specific Final Acute Value}}{\text{Site-Specific Final Acute-Chronic Ratio}}$$

After an acute-chronic ratio is determined for one species and if that ratio is within the range of the values used to establish the national acute-chronic ratio, it is recommended that the site-specific ratio be used in recalculating the national ratio. This recalculated ratio would then be used as the site-specific Final Acute-Chronic Ratio in the above equation.

- A site-specific Final Chronic Value can be obtained by testing indicator species for chronic toxicity. Test at least two indicator species, a fish and an invertebrate, using laboratory dilution water and site dilution water according to chronic toxicity test procedures recommended in Appendix A. For each species, use organisms from the same population, conduct tests at the same time and most importantly (except for the water source) under similar conditions (e.g., temperature, lighting). The concentration of the chemical in the toxicity tests must be within the solubility limits of the chemical. To avoid solubility problems, species selected for testing should be among the most sensitive to the chemical of interest (screening tests may be necessary).

Compare the laboratory and site water chronic values for each of the indicator species to determine if they are significantly different (limits of chronic values do not overlap).

If for a species the chronic values are not different, the water effect ratio = 1.0.

If the chronic values are different, calculate the water effect ratio for each species according to the following equation:

$$\text{Chronic Water Effect Ratio} = \frac{\text{Chronic Value in Site Water}}{\text{Chronic Value in Laboratory Water}}$$

Calculate the geometric mean of the water effect ratios for the species tested.

If the mean water effect ratio is not different from 1.0, the national Final Chronic Value is the site-specific Final Chronic Value.

If the water effect ratio is different from 1.0, the site-specific Final Chronic Value can be calculated by using the following equation: site-specific Final Chronic Value = Chronic Water Effect Ratio x the national Final Chronic Value (or the national Final Chronic Value adjusted to a quality characteristic of the laboratory water when appropriate).

The site-specific Final Chronic Value is used in the determination of the site-specific 30-day average concentration. The lower of the site-specific Final Chronic Value and the recalculated site-specific Final Residue Value (as described in the Recalculation Procedure) becomes the site-specific 30-day average concentration unless plant or other data (including data obtained from the site-specific tests) indicates a lower value is appropriate. If a problem is identified, judgment should be used in establishing the site-specific criterion.

° Limitations

- If filter feeding organisms are determined to be among the most sensitive to the chemical of interest from the national criteria document and/or other sources, and members of the same group are important components of the site food web, a member of that group, preferably a resident species, should be tested in order to discern differences in the biological availability and/or toxicity of the chemical of interest due to ingested particulates.

- Site water for testing purposes should be obtained under typical conditions and can be obtained at any time of the day or season. Storm or flood impacted water is unacceptable as test water in the acute tests used to calculate water effect ratios and acute-chronic ratios but is acceptable test water for short periods of time in long-term chronic tests used to calculate these ratios. There are some special cases when storm impacted water is acceptable in acute toxicity testing for use in criteria development. For example, an effluent discharge may be allowed only during high water periods, or a non-point source of a chemical pesticide may be of most concern during storm-related runoff events.

- Site water must not be influenced by effluents containing the chemical of interest or effluents that may impact the material's biological availability and/or toxicity. The site water should be used as soon as possible after collection in order to avoid significant water quality changes. If diurnal water quality cycles (e.g., carbonate systems, salinity, dissolved oxygen) are known to markedly affect a chemical's toxicity, use of on-site flow-through testing is suggested; otherwise transport of water to off-site locations is acceptable. During transport and storage, great care should be taken to maintain the original quality of the water; however, certain conditions of the water may change and the degree of these changes should be measured and reported.

- Seasonal site-specific criteria can be derived if monitoring data are available to delineate seasonal periods corresponding to significant differences in water characteristics (e.g., carbonate systems, salinity, turbidity).

- The frequency of testing (e.g. the need for seasonal testing) will be related to the variability of the physical and chemical characteristics of site water as it is expected to affect the biological availability and/or toxicity of the material of interest. As the variability increases, the frequency of testing will increase.

- With the exception that storm or flood impacted water may be used in chronic toxicity tests, the limitations on the use of indicator species to derive a site-specific Final Chronic Value are the same as those for site-specific modifications of a national Final Acute Value.

Resident Species Procedure

° Definition

Derivation of the site-specific maximum concentration and site-specific 30-day average concentration would be accomplished after the complete acute toxicity minimum data set requirements have been met by conducting tests with resident species in site water. Chronic tests may also be necessary.

° Rationale

This procedure is designed to compensate concurrently for any real differences between the sensitivity range of species represented in the national data set and for site water which may markedly affect the biological availability and/or toxicity of the material of interest.

° Conditions

Develop the complete acute toxicity minimum data set using site water and resident species.

° Details of Procedure

- Complete the acute toxicity minimum data set test requirements by testing resident species in site water and derive a site-specific Final Acute Value.

- The guidance for site water testing has been discussed in the indicator species procedure.

- Certain families of organisms have been specified in the National Guidelines acute toxicity minimum data set (e.g., Salmonidae in fresh water and Penaeidae or Mysidae in salt water); if this or any other requirement cannot be met because the family or other group (e.g., insect or benthic crustacean) in fresh water is not represented by resident species, select a substitute(s) from a senstive family represented by one or more resident species and meet the 8 family minimum data set requirement. If all the families at the site have been tested and the minimum data set requirements have not been met, use the most sensitive resident family mean acute value as the site-specific Final Acute Value.

- To derive the site-specific maximum concentration divide the site-specific Final Acute Value by two.

- The site-specific Final Chronic Value can be obtained as described in the indicator species procedure. An exception is that a chronic water effect ratio should not be used to calculate a Final Chronic Value.

- The lower of the site-specific Final Chronic Value and the recalculated site-specific Final Residue Value (as described in the Recalculation Procedure) becomes the site-specific 30-day average concentration unless plant or other data (including data obtained from the site-specific tests) indicates a lower value is appropriate. If a problem is identified, judgment should be used in establishing the site-specific criterion.

° Limitations

- The frequency of testing (e.g., the need for seasonal testing) will be related to the variability of the physical and chemical characteristics of site water as it is expected to affect the biological availability and/or toxicity of the material of interest. As the variability increases, the frequency of testing will increase.

- Many of the limitations discussed for the Recalculation and Indicator Species procedures would also apply to this procedure.

Heavy Metal Speciation

The national criteria for metals are established primarily using laboratory data in which reported effect concentrations have been analyzed primarily as total, total recoverable, or acid extractable metal concentrations. Metals exist in a variety of chemical forms in water. Toxicological data have demonstrated that some forms are much more toxic than others. Most of the toxicity appears to reside in the soluble fraction and, potentially, in the easily labile, nonsoluble fraction. The national criteria values may be unnecessarily stringent if applied to total metal measurements in waters where total metal concentrations include a preponderance of metal forms which are highly insoluble or strongly complexed. Derivation of criteria based on metal forms is not possible at this time because adequate laboratory or field data bases do not exist in which metal toxicity is partitioned among the various metal forms. Analysis of total and soluble metal concentrations when soluble metal is added to site water may indicate that the metal is rapidly converted to insoluble forms or to other forms with presumed low biological availability. Under these circumstances, derivation of a site-specific criterion based on site-water effect in either the indicator or resident species procedures will probably result in less stringent criteria values.

Use of the indicator species or resident species procedures is encouraged for derivation of site-specific criteria for those metals whose biological availability and/or toxicity is significantly affected by variation in physical and/or chemical characteristics of water. Measurement of both total recoverable and soluble metal concentrations during toxicity testing is recommended.

Plant and Other Data

In the published criteria documents, no national criterion is based on plant data or "Other Data" (e.g., flavor impairment, behavioral, etc.). For some chemicals, observed effects on plants occurred at concentrations near the criterion. The Site-Specific Guidelines procedures do not contain techniques for handling such data, but if a less stringent site-specific criterion is derived, those data may need to be considered.

EPA
United States Environmental Protection Agency
Assessment and Watershed Protection Division
Office of Water
Washington, DC 20460
June 1991

Dave
FYI
Bran

Water Quality Program Highlights

ATTACHMENT D

Florida's Method for Assessing Metals Contamination in Estuarine Sediments

Among the toxicants found in sediments, heavy metals (e.g., lead, cadmium, mercury, nickel) have been a continuing concern. These contaminants are frequently found in nonpoint source runoff, and elevated metals concentrations often signal the presence of other types of pollution. Metals are, however, a natural component of the coastal environment and, in small amounts, are necessary to the existence of marine and estuarine organisms. The EPA is currently working to develop sediment metal criteria that address the issue of bioavailability of sediment-bound metals to aquatic life. This is an important and complex issue because high concentrations of metals in sediment in and of themselves are not necessarily toxic–the metals may be tightly bound to sediment particles and/or organic matter thereby reducing their availability to be metabolized by aquatic organisms. Conversely, seemingly low concentrations of metals in some sediment types may be toxic to various aquatic organisms because the metals are more available for metabolism.

Florida's Department of Environmental Regulation (DER) has developed a method to identify sediments with elevated metals contamination using data on metals concentrations in sediments from unimpacted areas. The method does not identify sediments that are toxic (i.e., where benthic communities are impacted), but it permits targeting of areas of elevated metals concentrations for further chemical, toxicological, or biological assessments. This State's approach, which is based on natural relationships between metals in uncontaminated sediments, may be useful in other regions of the country where there is a need to investigate trends, manage cleanup efforts, or develop permits for dredging and disposal of sediments.

THEORETICAL BASIS FOR THE FLORIDA APPROACH

The background or "natural" concentration of metals in sediment can vary widely among marine waters, with concentrations generally being a function of watershed mineralogy, sediment grain size, organic content of the sediment, and the amount contributed by human activities. Such variability makes it difficult to define numerical criteria for sediment or compare sediment metals concentrations from different areas.

Florida's approach to interpreting sediment data is based on naturally occurring relationships between the sediment concentrations of various metals. Specifically, geochemists have found that several abundant crustal elements occur in a relatively constant relationship with heavy metals, which allows researchers to "normalize" or reference various metals to a single conservative element. This method offers the additional advantage of requiring data only on sediment metal concentration; other methods (sediment toxicity testing, partitioning, and benthic community structure) require data on numerous parameters.

Florida DER chose aluminum as the reference element because (1) it is highly refractory (i.e., it does not degrade or alter in form in the environment); (2) heavy metal/aluminum ratios are relatively constant in unimpacted estuaries; and (3) aluminum concentrations generally are not influenced by human activities.

DEVELOPING REFERENCE DATA

To set up their analyses, the DER sampled reference stations to document metals concentrations at 103 "unimpacted" (i.e., clean water) sites throughout the State of Florida. Duplicate samples were collected from the upper 5 cm of sediment for up to nine metals: aluminum, arsenic, ~~cadmium, chromium~~, copper, lead, mercury, nickel, and zinc. A total of 785 data points were obtained (all nine metals were not measured at each site).

Of the nine metals, mercury presented unique problems because (1) it is more volatile than the other metals; (2) natural background concentrations of mercury were near the analytical detection limit, where higher measurement error can be expected; and (3) an inverse mercury/aluminum ratio was observed. As a result, mercury was excluded from further analysis.

For the remaining eight metals, several steps were taken before statistical analyses were attempted. To satisfy the requirement that data exhibit a normal (i.e., bell-shaped) distribution, analyses were carried out using the logarithms of the raw data. In addition, probability plots were used to assist with decisions to discard some outlier values. This step was necessary to minimize the possibility of including data from sites with some enrichment and to satisfy statistical assumptions; a total of 18 out of the 785 data points were discarded. Finally, metal vs. aluminum regressions were completed, and 95% prediction limits were calculated.

Regression is a standard statistical method of fitting a line to data that describe the relationship between two variables; in this case, the dependent variable is the concentration of one of seven heavy metals, and the independent variable is the concentration of aluminum. The 95% prediction limit defines a range where the concentration of a metal can be expected to occur (with 95% confidence) under natural conditions. An example of the lead/aluminum relationship is shown in Figure 1. Similar plots showing a statistically significant relationship across the range of observed aluminum concentrations (47 to 79,000 ppm) were observed for all seven metals.

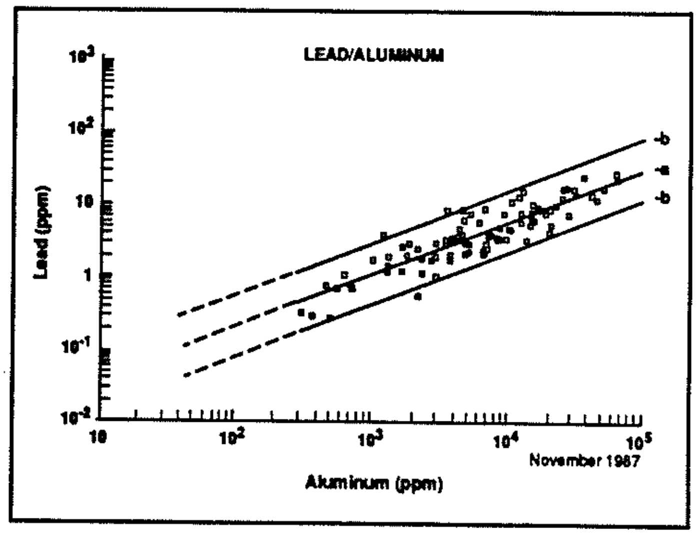

Figure 1. Lead/aluminum regression line (a) and 95% prediction limits (b). Dashed line indicates extrapolation beyond data range.

UTILITY OF THE METHOD

Florida DER has found the metal vs. aluminum plots to be useful in a number of ways. A key use is simply to flag stations where metal values may be in excess of naturally expected concentrations. An observation outside of the 95% prediction range should trigger closer investigation of possible pollutant sources. In addition, the method provides the ability to track trends in metal/aluminum ratios and has been used to determine where additional monitoring may be needed. For example, where sediment contamination is suspected, the State may perform sediment bioassays. Sediment bioassays involve exposing an organism to metal-contaminated sediments and measuring the effects of exposure on a biological endpoint (e.g., mortality, growth, or reproductive effects).

Experience gained in the studies of unimpacted coastal sites has enabled the DER to improve their sampling, laboratory, and interpretive activities. Key findings include the following:

- Duplicate or triplicate samples are crucial to reducing sampling variability.
- Total digestion of sediment samples in the laboratory is necessary to ensure release of metals that are tightly bound with the crystalline structure of sediment minerals.

THE BISCAYNE BAY STUDY

One application of the reference metal approach has been to assess toxicant levels in the Miami River-Biscayne Bay area of Miami. The river is a major tributary to the bay, is lined with ship berthing areas, and receives urban stormwater runoff from Miami. Sediment samples were taken at 11 stations in the river and bay (see Figure 2), and results were plotted over the regression lines and confidence intervals obtained from unimpacted areas. Of the seven heavy metals, arsenic and nickel fell within the expected natural ranges; chromium, copper, and lead concentrations were both within and above the predicted natural range, with most stations near the mouth of the river having the highest concentrations; and cadmium and zinc exceeded the predicted natural ranges at almost all the stations sampled.

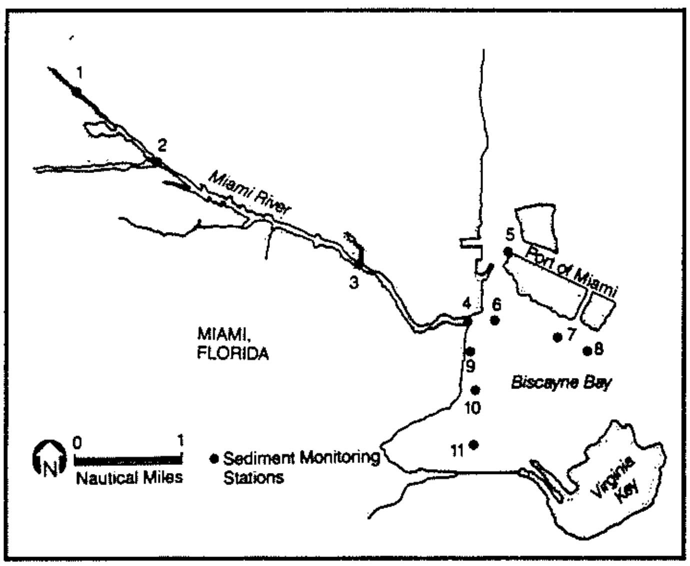

Figure 2. Sediment monitoring stations in the Miami River-Biscayne Bay area.

Figure 3 shows the sediment concentrations of lead at the 11 stations superimposed over the lines indicating the expected metals concentrations based on statewide sampling of unimpacted areas. The numbered data points indicate stations, with 1 representing the most upstream station and 11 representing the most downstream station. The increasing degree of enrichment with increasing aluminum concentrations is thought to be due to grain size effects. Fine-grain sediments (typical of the Miami River) more readily adsorb contaminant metals and generally have higher aluminum values. Similar conclusions could not have been reached using water column data alone.

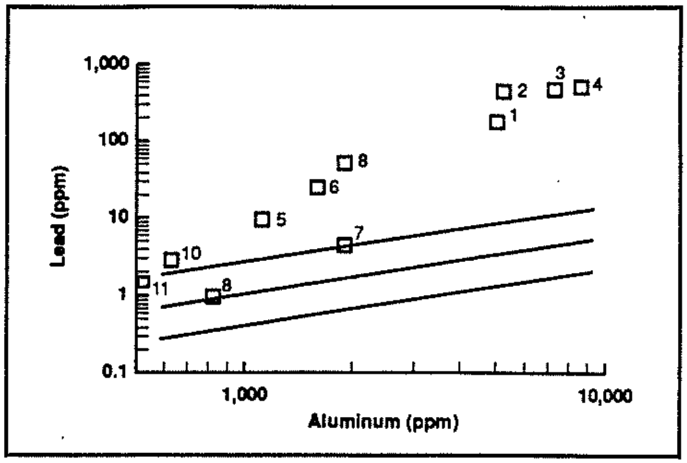

Figure 3. Lead concentrations in sediment from Miami River and Biscayne Bay. Regression line and 95% range from clean water sites are also shown.

The conclusion that the Miami River was contributing toxics to the sediments of the river and bay and that expansion in the area of contamination is likely in the absence of remediation has resulted in an increased commitment to reduce pollutant inputs to the system.

Similar studies have been completed successfully in other estuaries in Florida, including the Tampa Bay and Pensacola Bay systems. The approach has been found to be especially valuable in surveys of large systems, where it can be used to identify potential sources of pollution and assist in decisions regarding more intensive monitoring efforts. In addition to the quality of information obtained from the reference metal approach, the State has been pleased with the method's simplicity, cost-effectiveness, and the resulting improved consistency in regulatory decisions and reduction of regulatory delays.

Material for this report was furnished by Dr. Steven J. Schropp and Fred D. Calder, Florida Department of Environmental Regulation, Coastal Zone Management Section, Florida Department of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, FL 32301.

This report is produced by EPA to highlight monitoring and wasteload allocation activities. Contributions of information for similar reports are invited. Please contact EPA, AWPD, Monitoring Branch (WH-553), 401 M Street, S.W., Washington, DC 20460 (202) 382-7013.

1078

03 SEP 1991 Sm

Copy to Arnold

AMERICAN SAMOA GOVERNMENT
PAGO PAGO, AMERICAN SAMOA 96799

In reply refer to:

OFFICE OF THE GOVERNOR
ENVIRONMENTAL PROTECTION AGENCY

Serial: 362

August 21, 1991

Norman L. Lovelace, Chief
Office of Pacific Island &
Native American Programs
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

Dear Norm:

I received your letter dated August 01, 1991, concerning the risk assessment from data in the Pago Pago Harbor Toxicity Study. This information will assist American Samoa in determining an appropriate course of action. Officials from the Department of Marine and Wildlife Resources and the American Samoa Coastal Management Program will be meeting after we receive the final report from AECOS to evaluate the study findings and to provide recommendations to policy makers on the actions to be taken.

The recommended course of action will likely include:

1. Additional targeted study to verify the findings and provide statistically reliable results
2. Issuance of a fish consumption advisory and a carefully planned public education program.
3. Request to the Centers for Disease Control to conduct a well designed study related to the risk assessment calculations.
4. Investigate possible sources of the toxic compounds and eliminate or remediate them as possible.

I would appreciate any comments you or your staff have on this recommended course of action. The assistance of your office and Arnold Den in the risk assessment calculation has been invaluable. You may contact Sheila Wiegman of my staff for any questions.

Sincerely,

P. Faiai

Pati Faiai, Director
American Samoa Environmental
Protection Agency

cc: Environmental Coordinator
Enforcement Branch

N FYI. [illegible]

AMERICAN SAMOA GOVERNMENT
PAGO PAGO, AMERICAN SAMOA 96799

In reply refer to:

OFFICE OF THE GOVERNOR
ENVIRONMENTAL PROTECTION AGENCY
Serial:354

August 16, 1991

Norman L. Lovelace, Chief
Office of Pacific Island & Native American
Programs
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105

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Sincerely,

S. Faiai

Pati Faiai, Director
American Samoa Environmental
Protection Agency

cc: Environmental Coordinator
Enforcement Branch

samoa news, Friday, June 12, 1992

Study on health effects of local fish diet underway

A toxicity study conducted in 1990 found that people who consume fish caught in the inner Pago Harbor might suffer from numerous diseases such brain damage and cancer. "If lead contamination alone is considered, concentration may reach levels that would cause 70 to 80% of the children who regularly ate 3-4 fish meals per week to suffer a permanent reduction in intelligence," the study's final report noted.

It went on to say that there is also a potential of increased cancer risk. "Consuming fish from the inner harbor at a rate of 3-4 meals per week over a life time would significantly increases the risk of cancer due to arsenic contamination," the study found.

The toxicity study was jointly orchestrated by the American Samoa Environmental Protection Agency (ASEPA) the Department of Marine and Wildlife Resources (DMWR) and the American Samoa Coastal Management Program (ASCMP). Its priorities were to determine if fish in the inner Pago harbor (defined as the portion of the inner bay area between the village of Pago Pago and the harbor area from Leloaloa to the Rainmaker Hotel) pose a health threat to humans as a result of contamination of the sea environment.

"It's a concern that needs to be addressed and resolved," said ASEPA's Environmental Coordinator Sheila Weigman.

The study examined the toxicity of seawater, sediments and fish in the inner harbor. Sampling was conducted at six sites within the inner harbor in April and October 1990.

The 1990 study found that the "fish caught in the inner portion of Pago Pago Harbor are not safe to eat and may cause serious health problems." The fish tested were mullet (anae), jacks (lupo), surgeon fish (pelagi) mojarras (matu), and snapper (tamala). Although only five fish species were tested, the study found that all "fish species including shell fish and any other seafood product" also pose high risks of being poisonous.

Tests showed that the fish contained toxic metals and pesticides harmful to humans.

In explaining how the fish became poisonous, the report stated that most toxic chemicals, whether from oil spills or old paint chips and car batteries thrown into the harbor, eventually end up in the sediments at the bottom of the harbor.

"Some fish species feed directly on the bottom of the bottom or eat invertebrates that live in the bottom and in doing so the fish also eat the toxic substances. Other fish species eat these contaminated fish, and then they too become contaminated," attested the report.

The study noted that the "harbor sediments (and fish) were moderately to heavily contaminated with heavy metals (arsenic, chromium, copper, nickel and zinc)."

The toxic pollutants cited by the study were most likely present due to the accumulation of contaminants from industrial and military uses over the past century, according to the report.

DMWR Chief Biologist Dr. Peter Craig told Samoa News this week that there are are two types of pollution which plague Pago harbor.

The first comes from the canneries which have pumped nutrients that have caused "perpetual algae bloom and too much sediment collection." To minimize this problem in the inner harbor, the canneries recently installed a multi-million dollar pipeline to carry the high nutrient waste out of the inner harbor.

Craig noted that the more serious pollution is the dumping of pesticides, oil and metals. He said that some of the contaminants come from island streams leading into the harbor that carry trash. For example: aerosols, paint chips, oils, roof tin and rusted bolts and car parts.

In response to a recommendation in the study that ASG issue a health advisory and stage a public awareness program about the risks involved in eating fish caught in the harbor, the government took a series of steps.

An advisory was issued by Director of Health Dr. Iotamo Saleapaga, but fishing and sales of fish caught in the harbor were not initially banned. Later, they were, although there has been ineffective enforcement of the edicts.

To assure that fish species found outside of the Pago Harbor are free from contamination, ASEPA and DMWR is collecting sediments and fish species from 14 selected areas around the territory for testing.

"We are trying to determine whether the fish outside of the harbor are safe to eat," said ASEPA's Wiegman.

next page

TUESDAY, JUNE 16, 1992

* Guilty plea in Tafuna rape case

Maosi Fualaau, the Tafuna Correctional Facility inmate/escapee who was charged with seven felony counts of burglary, rape, kidnapping and robbery in relation to an incident in Tafuna on February 16, pled guilty Monday morning to one count of rape and one count of kidnapping.

As part of a plea bargain agreement reached by defense attorney Asaua Fuimaono and Assistant Attorney General Donald Sheehan, the government agreed to dismiss the remaining charges of rape, burglary, robbery, assault and escape from confinement.

He will be sentenced by the High Court on July 15. The rape charge carries a prison term of 5 to 15 years, while the kidnapping charge carries a prison term of 10 to 30 years.

Fualaau was to stand trial today for the rape of a female Tafuna resident on February 16 of this year. The crime took place after Fualaau escaped from the Tafuna Correctional Facility where he was serving a seven year sentence for the rape of another Tafuna housing resident in June of 1989. In the February incident, Fualaau broke into the home of the victim and threatened her life while subjecting her to sexual acts against her will.

Officers at the Tafuna Correctional Facility said that they discovered Fualaau had escaped from his cell around 1:00 am and had already launched a search for the escaped prisoner at the time that the crime was taking place.

Fualaau was recaptured around 7 a.m. the following morning 100 yards from the victim's house. The incident sparked an outcry from Tafuna residents about lax security at the prison *(see story below)*.

Interior to pay half the cost of local health study on toxic fish

Half of the cost of the recently publicized study of the health impacts of eating locally-caught fish will be met by the Department of Interior, it was announced yesterday.

Assistant Secretary for Territorial and International Affairs Stella Guerra approved $46,500 in technical assistance funding that will provide matching funds to the Government of American Samoa to conduct a toxicity study of potential pollutants found in local fish and sediment samples.

"This project is an important part of our long-range goal of protecting the public health and environment of the insular areas," Assistant Secretary Guerra said. "Governor Coleman has stressed the importance of monitoring aquatic resources for safe consumption."

In 1991, the American Samoa Government (ASG), with assistance from the U.S. Environmental Protection Agency, completed a pilot study of toxins in the fish and sediments of Pago Pago Harbor. Results showed the inner harbor was badly contaminated and the fish were not safe to eat.

The follow-up study will determine the amounts of heavy metal and chemical contaminants in the inner harbor and at 14 additional sites, as well as a health assessment of the people living near the harbor.

June 16, 1992

Study on toxins in Pago* Harbor getting underway

Three representatives from the federal Agency for Toxic Substances and Disease Registry have arrived to conduct tests on 200 residents of the Pago Pago Harbor and the island of Tau.

The purpose of the study is to determine if the exposure of local residents who eat fish caught in Pago Harbor causes higher levels of disease.

The study is a follow-up to a research paper published last year which showed alarmingly high levels of toxins in the fish of Pago Harbor, as well as the muck lying at the bottom of the harbor.

The study team is led by Principal Investigator Dr. James Walker. His team, which also of Lynn Berlad and Kelli Davis, will be joined in the future by two scientists who will help in conducting the research.

A conference held yesterday provided government officials involved in the toxicity issue and the media with details on the study to be conducted by Dr. Walker and his associates.

At the conference, Walker stated, "The purpose of our study is to look for and see how high the metal content (Mercury, Lead, Nickel, Chromium, Arsenic, and Cadmium) is in the bodies of local residents. The study of Ta'u residents will give us a population of local residents who have not been exposed to Pago Harbor fish to which we can compare the toxicity level of Pago Harbor residents. Once we know this, Public Health Director Edgar Reid and the Director of the Health Dr. Iotamo Saleapaga can use this information to make moves in controlling the contamination" and limiting exposure to disease.

Governor Peter Tali Coleman asked Walker if the study will provide cures for some people that have high levels of dangerous metals in their system.

Walker replied, "The study will not provide cures but will provide statistical information that will help Health and Environmental officials decide on what types of measures to take."

He also added that the study will not be able to answer questions regarding the source of the contamination.

Samoa news asked Walker what types of abnormalities might Samoans face as a result of high metal content in their bodies?

Walker replied, "There can be disorders of liver, kidney, immune system and blood system which can lead to leukemia." Earlier reports indicated that loss of intelligence amongst children was also a possible risk.

He then went on to add "The project will try to find out the health effects of low long term exposure. That information will be useful in predicting health factors Samoa's youth can expect in the future if nothing is done.

"As far as I'm concerned this is a most important study in that the Federal Food and Drug Administration has no agency to inspect fish distribution in the United States. This study will make aware to sports fishermen and consumers the contamination of fish (if any)," said Walker.

The group has randomly selected 200 households (100 in each area), and one member per household will be asked to participate in the study, which should get underway Monday.

The study group, accompanied by local Public Health nurses, will take blood and urine samples and then ask specific questions, such as: How much fish do you eat a day and what kind?

The blood and urine samples will also indicate health disorders of participants that may not be associated with the study objective.

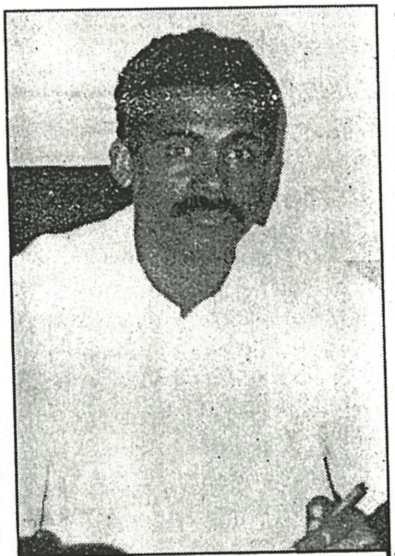
The results of the tests will not be available immediately, but should be completed by the end of the year. Participants who are tested and found to have a high health risk will be notified immediately.

June 17, 1992

CDC to conduct survey

Is the fish safe to eat or not? That question, which has taken on new urgency since an alarming environmental report was issued six months ago, will be more easily settled when a medical survey of local residents is completed. Such a survey would show whether people who eat a lot of fish from the Pago Harbor have high levels of poison in their system.

A medical expert in toxic (poisonous) diseases was on-island last week to work with the local Health Department to design and implement just such a survey.



Dr. James Walker

Dr James Walker of the Center for Disease Control in Atlanta, Georgia is designing a survey which will involve 200 to 500 American Samoan residents.

The survey will supplement the well-known environmental survey that investigated Harbor fish for toxicity. That study's conclusions were released last year.

"In our report, we found high levels of arsenic, chromium and lead in the inner harbor area," Sheila Weigman, Environmental Co-ordinator for the American Samoa Environmental Protection Agency, told the Samoa News last week.

"With the levels that we found in fish in the inner Pago Pago harbor, we estimate that 70% of children under the age of 7 who ate such fish 4 times a week could have suffered mental retardation as a result. People are also at risk of getting cancer from the levels of arsenic in the inner harbor fish."

"In view of the recent evidence from the ASEPA it is important for every Samoan to know how much exposure they and their families may have had to these toxins and what is the possible risk to their health," Walker told the News last week.

The survey will begin in 3 to 4 weeks when Walker returns. The Department of Health and various health centers around the island have undertaken to support the survey. Dr Reid, director of the ASG Public Health Division, is at present assisting Walker in devising a questionnaire which will relate directly to the local populace.

Volunteers of all ages from villages throughout American Samoa will be invited to participate in the survey. "A selection of people will be drawn from several distinct locations, for example some villages in close proximity to the inner harbor, others from further away, so that we can draw a comparative analysis of levels of exposure to toxins in different parts of the island," explained Walker.

Volunteers will be selected on the basis of the local availability of their medical records and their length of residency in the country. People who have lived here for less than 6 months to a year will be excluded. Also any person suffering from a severe debilitating illness will be prohibited from taking part. Each volunteer will be given a 45 minute appointment and required to fill out a questionnaire and to provide samples of blood, urine and hair.

"The questionnaire is designed to ascertain sources of exposure to toxins. It will include a list of questions to cover a very detailed history of dietary, occupational and household exposures," explained Walker. Walker predicts that the survey will take 30 to 90 days to implement, depending on public support.

The specimens taken for each person will be analyzed in a CDC laboratory in Florida and then Walker will make a final statistical analysis of all the data collected. "The eventual report will most certainly be made available to the American Samoan people," promised Walker.

Dr Walker has conducted similar assessments of levels of toxicity in various groups of people who consume large quantities of fish, including the Chippewa Indians in Northern Minnesota and the Native Americans found in the Everglades of Florida. In both cases the fish were contaminated with mercury.

Samoa News
1/28/92

Post-It™ brand fax transmittal memo 7671	# of pages ▸ 1
To Pat Young	From Mel Waki
Co. EPA Region 9	Co. PACDIV
Dept.	Phone #
Fax # (415) 744-1604	Fax # (808) 474-4519

...have to be on our own, but we have to know how to take care of our people, our land and our water."

More than 100 government leaders, tour directors, bankers and business people, and academic leaders attended the conference, titled "Ecological Tourism and Small Business in the Pacific." Discussions examined the impact of ecotourism on island economies, how to evaluate potential ecotourism sites and the importance of training so islanders are able to run their own businesses.

The conference was presented by the Pacific Business Center of the University of Hawaii in association with the U.S. Commerce Department's Economic Development Administration and the Pohnpei State government.

...eals ...roblems

...Seminar in Chuuk, ...f Francis X. Hezel, investigating social ...derated States of ...Occasional Papers" began circulating early last year with an analysis titled "Chuuk's Violence: Then and Now," by Innocente I. Oneisom. Subsequent papers have covered child abuse, use of marijuana in the islands and the breakdown of the Micronesian traditional family. The series is titled *The Micronesian Counselor* and is sponsored by the FSM Mental Health Program under the direction of Ammette Zimmern.

"We are making our selection of topics as broad as possible to provide something of interest to as many of our readers as possible," Hezel said. To become a reader, write Fr. Hezel at Box 250, Moen, Chuuk, FM 96942.

Gene Ashby

Pago Pago Harbor Pollution Blamed on Navy

The pollution of American Samoa's Pago Pago Harbor, which has made its fish inedible, is being blamed on the U.S. Navy.

Health authorities say both fish and shellfish are contaminated by high levels of lead, arsenic, chromium, zinc and nickel. American naval and whaling stations were established at Pago Pago last century and local historian Tuaolo Lemoe said there have been many navy oil and ammunition spills over the years.

For example, he said in 1949 the fully loaded oiler *USS Chehalis* sank in the harbor, and other accidents have occurred during replenishing of U.S. warships and supply vessels.

Local media are questioning why public warnings about the contamination had not come earlier. People, particularly children, are at risk from short-term poisoning, mental retardation and long-term development of serious diseases.

Meanwhile, American Samoa Congressman Eni F.H. Faleomavaega has asked the U.S. Environmental Protection Agency for assistance in determining the best method for improving the quality of the water in the harbor and the cost to clean it up.

Heart, Eye Surgery Done By Medical Teams

Medical teams from the United States and Australia were in Fiji recently to perform eye and heart surgery.

At luxurious Turtle Island lodge in the Yasawa Group, a team of volunteers from California led by Dr. Jerold Beeve operated on 20 patients from all over Fiji. The eye operations were carried out in premises built especially for the purpose by the lodge's owner, Richard Evanson.

The US$68,000 project was assisted by the U.S. optical equipment company, Alco, and by QANTAS. Evanson provided accommodations for the team and told *Pacific* that a similar visit in January 1991 had been a great success. "Sight was restored to people who had been blind for years," he said.

Elsewhere in the country, a 36-member team of heart specialists and technicians from the Adventist Hospital in Sydney spent two weeks performing cardiac operations including the first-ever open-heart surgery in Fiji.

The team, which paid its own airfares, performed up to three operations a day using equipment donated by Sydney business organizations. The Australian Embassy in Fiji assisted with air freight for the 3-1/2 tons of equipment required. The Courtesy Inn in Suva accommodated the team. This also was the Australian group's second visit to Fiji.

Norman & Ngaire Douglas

Don't Mess Around With The Big Boys, Fella

The wrath of the giant international hamburger chain, McDonald's, has fallen on the head of the humble owner of a Chinese restaurant in New Zealand.

It all started when Nick Chong decided to name his new eatery in Wellington, McWong's. He chose the name, he said, to reflect his Scottish and Chinese parentage. He then chose for the restaurant's sign a gold "W."

The only problem was, the "W" looked an awful lot like the McDonald's trademark golden "M," only upside down.

Chong received a letter from a McDonald's lawyer demanding that the sign be removed. A man of modest means who said he could little afford a court case, Chong complied.

Radio Australia

Watch That Betelnut Juice, Solomon Islanders

Authorities in the Solomon Islands capital of Honiara have installed on-the-spot fines for litterbugs found tossing trash around in public places.

It could also be called on-the-"spit" fines. The ordinance includes penalizing betelnut chewers who spit in public.

Radio Australia

MADD Takes Aim At *Kava* Drinkers

Mothers Against Drunk Driving (MADD) of Wellington, New Zealand, has called for a ban on importing and consuming the traditional Pacific Islands beverage called *kava*.

The size of the country's Pacific Islander population and the demand for *kava* has resulted in the substance being available in supermarkets and convenience stores. MADD spokesperson Debbie Naylor said the organization wants to classify *kava* as an illegal drug.

The unprepossessing drug, admittedly narcotic rather than alcoholic, is made from the pulverized roots of the plant, *Piper methysticum*, a variety of pepper. It still has considerable cultural and ritual significance in islands where it continues to be consumed.

(Continued on page 52)

Poison Pago fish: Some questions are answered

The following press release concerning fish from the Inner Pago Pago Harbor was prepared by the American Samoa Government and is reprinted as a courtesy to our readers.

The American Samoa Government Department of Health has determined that the sale of fish caught in inner Pago Pago Harbor is prohibited in response to the fish consumption health advisory issued in late October, 1991. A recent study examined the toxicity of sea water, sediments, and fish in the inner harbor (defined as that portion of the inner bay between the village of Pago Pago and a line from Trading Point to the Rainmaker Hotel). Heavy Metal contamination in concentration of concern was found in the fish which could lead to potential brain damage and increased cancer risk. The fish consumption advisory received media attention and a public awareness campaign, but it became evident that further action was necessary to protect the public health.

The public is advised to ask where fish were caught before buying. The ASG has efforts underway to examine the impact of the fish consumption on the human population in American Samoa. The Center for Disease Control completed a fact funding trip in January and will begin a study in the next several months. Additional territory-wide study on the environmental contamination and possible sources will likely begin later in 1992. Until further data is available, the public is advised to abide by the fish consumption warning and ban on the sale of fish caught from inner Pago Pago Harbor.

QUESTIONS AND ANSWERS ABOUT TOXIC FISH IN PAGO PAGO HARBOR

Q. If the fish are really contaminated, why has no one in my family ever gotten sick from eating inner Pago Harbor fish?

A: The fish in Pago Harbor contain heavy metals and other contaminants which can cause long term health effects. These contaminants often take years to accumulate to the point where they cause health problems. Therefore, there are no immediate obvious reaction or sickness as a result of eating the fish.

Q. If the fish are contaminated, why don't they look bad or sick?

A: Often times, there are no obvious signs of the contaminants in the fish. Although they may be highly toxic to humans, they appear healthy and normal both inside and outside. These contaminants also take years to cause health effects in fish.

Q. Are all the fish in inner Pago Harbor contaminated?

A: All five fish species tested were contaminated. These included: Mullet (Anae), Jacks (Lupo), Surgeonfish (Palagi), Mojarras (Matu), and Snapper (Tamala). Therefore, until we collect more information on additional species, we must assume all inner harbor fish are unsafe to eat.

Q. What are "lead" and "heavy metals" and why are they a health risk?

A: Lead and other heavy metals (chromium, copper) are naturally occurring substances. However, these substances are concentrated to produce paints, solvents, and machinery used for a variety of household and industrial uses. Improper disposal of these contaminants near or in water causes them to accumulate in the sediments and water. The smallest marine organisms and fish further concentrate the contaminants. Thus, humans eat the fish, and the contaminants accumulate until they suffer health effects.

Q: What are the "other contaminants" and why are they a health risk"

A: We do not know for sure, but it is likely that the contaminants have accumulated in harbor sediments since the very first industrial and military uses of the harbor in the 1930's. It has only been recently that these types of toxic accumulations have been recognized. Surface runoff and other discharges into the harbor during the past decade may have contributed to the problem.

Q: What are the sources of contamination?

A: There is no known single source for the contaminants identified in the toxicity study. We suspect that the contami-

(Continued on page 7)

* PAGO

from page 6

nants come from a wide variety of household, industrial and natural sources. Paint chips, car batteries, pesticides, and various petroleum products (oils and greases) are all contributing factors. Few people realize that whatever we dispose of on land in your own backyard contaminates our soil, our water and eventually fish.

Q. What is being done to determine the sources of contamination.

A: Much of the contamination probably occurred decades ago. However, there are also probably several unidentified "point" and "non-point" sources contributing contaminants to he harbor. The "point sources" which consists of industrial waste outfalls and other commercial activities in the harbor have been identified and are being monitored. Non-point sources, like individual households or roadway runoff are difficult to identify. This type of contamination will require public understanding and commitment to stop leakages, spills and dumping. Another project is to identify past military sites in the harbor area and determine if potential contaminants still exist.

Q. What will future studies achieve and when will they begin?

A: In 1992, we hope to determine: 1) if lead and other heavy metals are affecting the people in American Samoa, 2) the extent of the environmental contamination by the toxic substances, 3) where it is safe to fish, and 4) what caused the environmental contamination.

Q: What can be done to clean up the harbor?

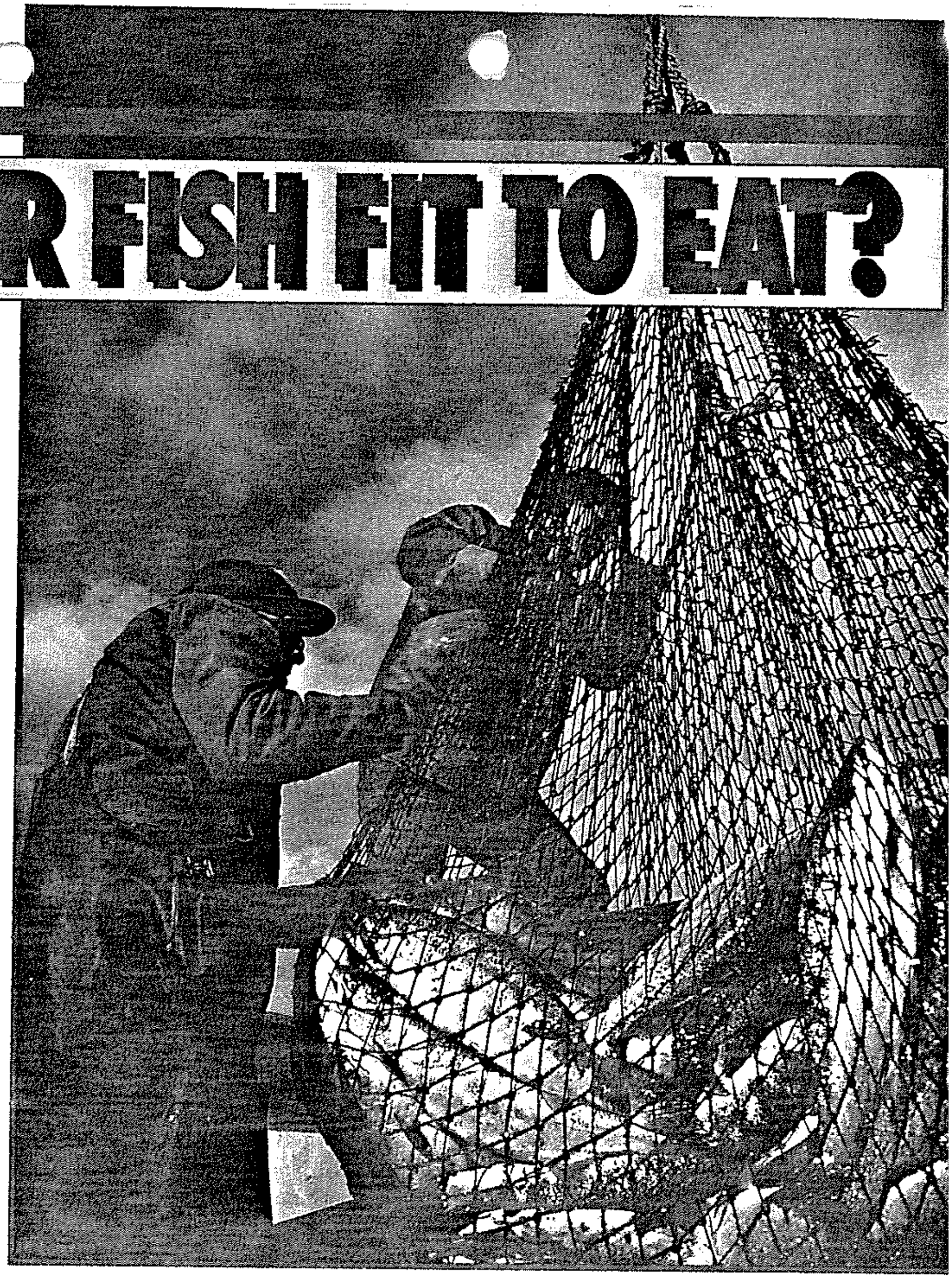
A: We suspect that most of the contaminants are in the harbor sediments and will not disappear overnight. Once the sources are identified, we will be better able to decide how to clean them up. For instance, if we located leaking barrels it may be possible to remove them especially if they are on land. Likewise, if a particular area is shown to heave heavily contaminated sediments, we might be able to "cap" the area with a non-toxic cover to prevent further contamination. Over time, natural erosion of the hill slopes in the harbor watershed will eventually (10-30 years) cover the contaminated sediments with non-toxic clean sediments.

Q: What is being done to educate the public?

A: The public education program includes: 1) health advisories issued by the American Samoa Government; 2) information fliers and health bulletins; 3) training for all public extension workers; 4) public notices in the newspapers; 5) radio and television public service announcements; 6) warning signs around the inner harbor; and 7) presentations to village pulenu'us, schools, hospital physicians, nurses and public health officials.

If you have any questions or require more information, please contact the American Samoa Environmental Protection Agency at 633-2304.

IS OUR FISH FIT TO EAT?



Allstock photo - David Barnes photographer

A six-month investigation of fresh fish and shellfish raises serious questions about their quality.

Americans are eating more fish. Over the last decade consumption per person in the U.S. has risen nearly 25 percent—from 12 ½ to 15 ½ pounds a year. However, a six-month investigation by CU raises questions about the quality, wholesomeness, and, in some cases, the safety of the fish consumers are eating. Almost 40 percent of the fish we sampled was of fair or poor quality, and 30 percent was downright poor.

Nearly half the fish we tested was contaminated by bacteria from human or animal feces, most likely the result of poor sanitation practices at one or more points in the fish-handling process. Some species were contaminated with PCBs and mercury, which can pose health hazards to certain people (see What Else Is in Fish?, page 112).

We also found that many retailers were engaging in deceptive selling practices. Some merchants refer to the fish in their counters as "fresh" when it has actually been frozen and then thawed for display. Others mislabel the species of their fish, either deliberately or out of ignorance. As a result, consumers end up eating some fish other than the one they thought they had purchased, usually paying more than they should have. One-third of our fish samples were mislabeled.

To check for fish quality and chemical contamination, we bought seven popular and readily available species—salmon, flounder, sole, catfish, swordfish, lake whitefish, and clams—from supermarkets and fish stores in New York City, Chicago, and their suburbs. Except for clams, which were in their shells, we always purchased steaks and fillets, the cuts most people buy.

Our reporter, a CU shopper, and an expert on fish quality visited stores, observed display counters, and purchased samples. We bought whatever fish on our list the store had available; we did not search out fish of obvious poor quality.

We shipped our 113 samples in refrigerated containers by overnight delivery to a contract laboratory. The samples were all in their original store wrappings when they arrived at the lab.

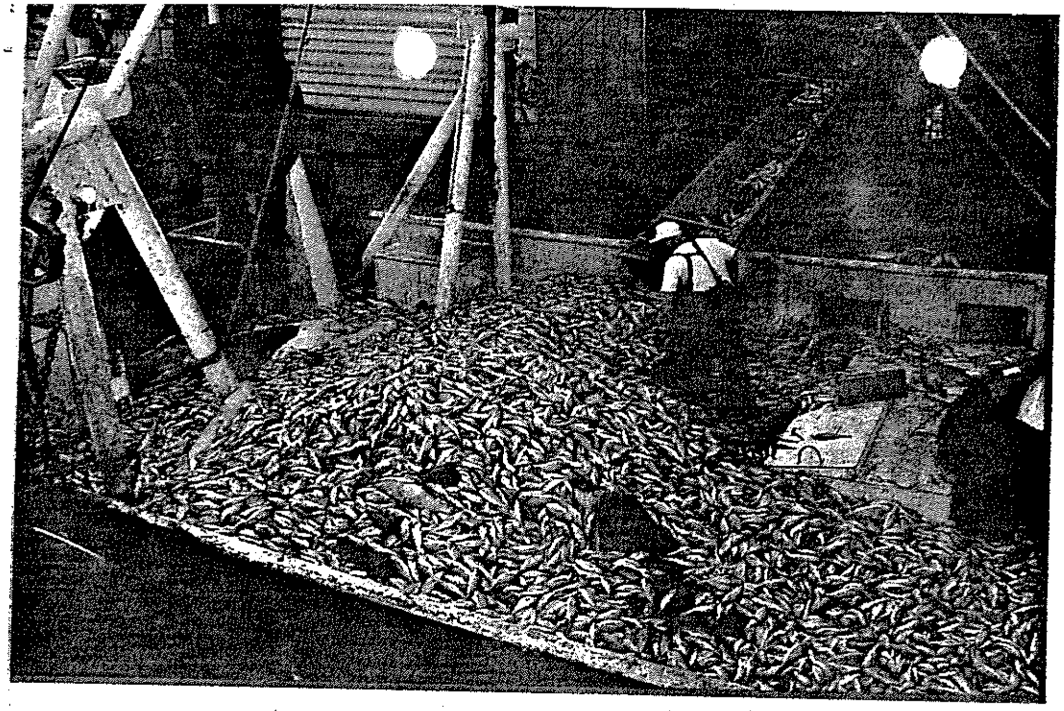
To check the accuracy of package labeling, we bought a different set of samples in metropolitan New York, metropolitan Chicago, and in the San Jose-Santa Cruz area of California. A report on those results begins on page 110.

How good fish goes bad

Fish is one of the most perishable of all foods. Bacteria are the main culprits in the spoilage process, although natural enzymes that break down the flesh of dead fish and oxygen in the air do their part, too. When ocean fish begins to spoil, it produces a compound called trimethylamine, which causes the "fishy" odor that people associate with bad fish. Fresh fish has virtually no odor.

Time and temperature are the enemies of freshness and flavor. Bacteria multiply rapidly when fish are out of water too long or are stored at temperatures that are too high. Since fish are cold-blooded and live in cold environments, many kinds of bacteria that live on them also thrive at colder temperatures. As a result, those bacteria are quite comfortable at temperatures found in

Net worth
The U.S. fishing industry hauls in about 9.4 billion pounds of fish each year, worth roughly $3.5-billion. More than half the catch goes for human consumption, the rest for pet food and industrial products.



From sea to supermarket Fish endure a long journey before reaching your dinner table. Many spend several days on a fishing boat before they go to a processing plant. There they are cleaned and often cut into fillets. From the processor, they travel in refrigerated trucks or by airplane to retail stores around the country. Elapsed time: as many as 15 days.

home refrigerators, and many can easily grow there.

Most fish have a shelf life of seven to 12 days at best once they are out of water. But the fish that reaches your dinner table may have been out as long as 15 days. A fish may remain on a boat for five or six days after capture. It may spend another day or two at a processor or a wholesaler and in transit to a retailer. It may then wait in a retailer's display case for several more days until you come along and buy it.

If fish gets too warm at any stage, it will deteriorate even faster. Ideally, fish should be kept between 30° and 32°F for optimum shelf life and quality. Enduring a 34° temperature even for one day will cost a fish one day of its shelf life; 36°, two days; and so on. In general, for every 10-degree increase in temperature above 32°, anywhere along the way, shelf life is cut in half.

Fatty fish, such as herring and mackerel, have a shorter shelf life than, say, cod or halibut, which are leaner. (Oxygen attacks the fatty tissues and causes rancidity.) And fish caught in colder waters will remain fresh for a shorter time than those from tropical waters. (Bacteria on warm-water fish don't reproduce as fast at refrigerator temperatures.)

Because time and temperature are so crucial in maintaining quality, the maxim in the industry is: "Keep it cold, keep it clean, keep it moving." However, we found ample evidence that the people handling fish are not keeping it cold enough or clean enough.

Bacteria by the million

A general indicator of fish quality is the "aerobic plate count," a measure of the number of bacteria on the surface of a fish at any given time. Good-quality fish usually have bacteria counts lower than 500,000 colonies per gram. But even that is no guarantee of quality. Two of our samples with relatively low counts nevertheless smelled putrid, indicating advanced spoilage. Retailers in those instances may have washed the fish before we bought it, rinsing away surface bacteria and disguising the actual condition of the fish.

Many of our "good" samples had been frozen and were slowly thawing in the grocer's display case. Freezing retards bacteria growth, but once the retailer thaws it, the fish will suffer the same deterioration as fish that have never been frozen.

Though bacteria counts higher than 500,000 indicate deteriorating quality, fish truly begin to spoil when bacteria grow to between 1 million and 10 million colonies per gram. Almost 40 percent of the fish we tested had counts within that range, most likely because it had been stored too long or kept at temperatures that were too high.

Three clam samples bought from premier seafood sellers in Chicago and one from a New Jersey supermarket contained more than 1.6 million bacteria colonies per gram. Shellfish containing more than 1.5 million colonies per gram set off alarm bells at state agencies that monitor shellfish safety. Those agencies then monitor future shipments from that source.

When bacteria counts hit 10 million or more, fish should be headed for the grave instead of the dinner plate. Yet bacteria counts exceeded 10 million in nearly 30 percent of the fish we purchased. And for nearly 25 percent of our samples, including most of the catfish, the counts exceeded the upper limits of our test method, 27 million colonies per gram.

A total aerobic plate count doesn't indicate what types of bacteria are present. We checked our samples for coliform and fecal coliform bacteria, common types that can indicate the presence of harmful organisms. Coliform bacteria are generally found in the intestinal tracts of humans and other warm-blooded animals.

Fecal coliforms can include disease-causing organisms, such as some strains of *E. coli*, which produce severe diarrhea. In general, the higher the level of fecal coliforms, the higher the probability that harm-

Photo above by Jon Simon

ful organisms are present.

Shellfish might pick up fecal coliform bacteria if they are harvested from polluted waters, but fecal coliforms are not normally found on finfish when they are caught. So any that show up were most likely introduced as the result of poor sanitary practices during processing or distribution, or when the fish were displayed for sale.

According to experts in seafood microbiology, a fecal coliform count greater than 10 per gram indicates some contamination. Counts over 100 are cause for serious concern because they indicate something more than ordinary environmental contamination.

A disturbingly high percentage of our samples—44 percent—contained more than 10 fecal coliforms per gram. More than half of our New York samples contained 10 or more fecal coliforms. One-third of the Chicago samples did.

Twenty-two percent of our samples had fecal coliform counts that exceeded 100 per gram, and 15 percent had counts greater than 500. Most of the latter came from stores in the New York area.

The Federal government sets no standards for the number of fecal coliforms permissible in raw finfish. But for shellfish, which may become contaminated as living organisms, and often are eaten raw, the Interstate Shellfish Sanitation Conference draws the line at 330 fecal coliforms per hundred grams, or 3.3 per gram. When shellfish has counts that high, health agencies can order further tests to determine whether they should be destroyed. (The Interstate Shellfish Sanitation Conference is a group of officials from states that ship and receive shellfish. The group develops model regulations for states to use in monitoring shellfish safety.)

Despite those efforts, eight of our 21 samples of clams, or 38 percent, contained fecal coliforms far exceeding the standard of 3.3 per gram. Counts for five of the eight were more than 10 times higher than the regulatory limit.

Will you get sick?

Spoiling fish smells and tastes bad. But thorough cooking kills the bacteria, along with the parasites that sometimes inhabit raw fish. So, thoroughly cooked fish, even though spoiled, probably won't make you sick. One exception is red-muscled fish, such as tuna, which produce toxins that can cause histamine poisoning in some people; heat will not destroy those toxins.

But if you eat uncooked or partially cooked fish, such as raw shellfish, sushi, or the lightly seared fish steaks that are in vogue at many restaurants, you may be putting yourself at risk.

The harmful organisms from fish can also make you sick if they get on food that is already cooked or on food that needs no cooking. Such "cross-contamination" can occur in your kitchen if you chop other foods on a cutting board where raw fish was sitting, or at the supermarket where cooked seafood salads are often displayed right next to raw fish (see page 107).

The Centers for Disease Control (CDC) says that from 1978 to 1987, fish and shellfish caused 3.6 percent of all reported cases of food-borne illness and 10.5 percent of all outbreaks. (An outbreak usually consists of two or more people getting sick from the same apparent cause around the same time.)

Those numbers, however, may not adequately describe the size of the problem. "The CDC data greatly underrepresent the actual total of seafood-borne illness and are skewed toward the highly visible, readily identifiable syndromes such as those associated with toxins," says Dr. John Liston, professor emeritus at the University of Washington's Institute for Food Science and Technology.

Indeed, most of the cases reported to the CDC were caused by shellfish or by naturally occurring toxins in red-muscled fish and in fish that live in tropical reefs, such as snapper.

"For finfish, it's amazing how little has been reported," says Dr. Sanford Miller, dean of the Graduate School of Biomedical Sciences at the University of Texas Health Science Center. "If someone gets a stomach ache, they don't associate it with the catfish they ate last night."

The road to ruin

Fish can, of course, get too warm or become contaminated anywhere in the distribution chain—on the fishing boat, in the processing plant, on the loading dock, at the wholesaler,

Favorite fish
The seafoods Americans eat most:

1. Tuna
2. Shrimp
3. Cod
4. Alaska pollock
5. Salmon
6. Catfish
7. Clams
8. Flounder/sole
9. Scallops
10. Crabmeat

Source: U.S. Dept. of Commerce

Buying Fresh Fish

HOW TO PROTECT YOURSELF

These pages tell a sorry tale of an excellent high-protein, low-fat food degraded not only by sloppy handling in the distribution chain, but by environmental pollution. The sloppy handing results in high bacteria counts. The pollution (as detailed in What Else Is in Fish?, page 112) results in worrisome levels of hazardous chemicals and heavy metals.

What can you do? For pregnant women or women who expect to become pregnant, there's little choice but to avoid many popular types of fish. Salmon, swordfish, and lake whitefish may well contain polychlorinated biphenyls (PCBs), which can accumulate in the body to the point where they pose a risk to the developing fetus. Swordfish and tuna too often expose women to mercury, which could also harm a fetus. Young children, too, should avoid those fish.

Clued to the gills When buying whole fish, look for gills that are bright red and moist. Don't buy if the gills are clumped together, brown, or covered with mucus.

People in these high-risk groups can still enjoy such species as flounder, sole, and catfish. Other people can pretty much eat what fish they like, but prudence would suggest varying the fish diet to no more than one portion a week of a food likely to contain PCBs or one likely to be high in mercury.

For most people, the biggest challenge will be finding fish that is both fresh and clean—and then cooking it properly. Here are some guidelines:

- When buying whole fish, look for bright, clear, bulging eyes. Cloudy, sunken, discolored, or slime-covered eyes often signal fish that is beginning to spoil.

The skin of freshly caught fish is covered with a translucent mucus that looks a bit like varnish. The color is vivid and bright. Avoid fish whose skin has begun to discolor, shows depressions, tears, or blemishes, or is covered with sticky yellowish-brown mucus.

- When buying steaks or fillets, look for moist flesh that still has a translucent sheen. Watch out for flesh that's dried out or gaping (the muscle fibers are beginning to pull apart). That's a sign of over-the-hill fish.
- Note how the fish is displayed and look for clues that the temperature may be too high. Fish that are piled high, displayed in open cases, or sitting under hot lights are perfect places for bacteria to grow. If fish fillets are displayed inside separate pans surrounded by ice, that's usually a sign the retailer is paying some attention to quality. Whole fish should be displayed under ice.
- Carefully evaluate store specials and price reductions. Specials may be a way to move older fish. Most retailers would rather reduce the price than throw away fish. A "Saturday-get-rid-of-it special" will be cheap but may not make the tastiest meal.
- Look for evidence that fish has been frozen and then thawed. Note which fish have "fresh" display signs on them. Look for chunks of ice floating in the fish liquid—a clue that the fish had been frozen. If you're not sure, ask. Although many shelf tags we saw were not honest, some of the clerks we talked to were.

There's nothing wrong with frozen fish, but if you unknowingly buy fish that had once been frozen and then you refreeze it, its texture and flavor will suffer. It's probably better to buy frozen fish instead.

- Keep an eye out for pretty displays of cooked seafood sold next to raw fish. They're a potential health hazard, and buying anything from them can be risky.
- Use your nose. Fresh fish smell like the sea, but they have no strong odor. Freshwater fish in good condition sometimes smell like cucumbers. Strong odors usually indicate spoilage.
- Once you buy fish, refrigerate it quickly. At home, store it in the coldest part of your refrigerator, keep it in the original wrapper, and use it fast—within a day. If our shopping experience is any guide, a lot of fish has little shelf life left.
- After handling raw fish, be sure to wash all surfaces the fish touched.
- Cook fish thoroughly—just until it is opaque and flakes easily with a fork. Overcooking makes it dry. The best way to learn the technique is to practice.

One last bit of advice: Think twice before you eat fish raw. Although raw fish may be fashionable at the moment and even taste good, you're taking a risk. Even if you think you know where the fish came from and trust your dealer or restaurateur, you can never be absolutely sure the fish does not harbor parasites or high levels of bacteria.

in the supermarket, on the way home, or in the kitchen.

Our reporter observed problems all along the distribution chain. For example, in Montauk, N.Y., she saw squid piled up on a gravel driveway. It had overflowed from the pipeline meant to carry it from the fishing boat to a refrigerated truck. Workers simply shoveled the squid into the truck.

On a hot July day, she observed workers in a processing plant cutting tuna steaks in a room that was obviously too warm. She saw salmon covered with ice taken from dirty ice bins, and salmon waiting in a truck where the refrigeration unit had stopped running.

Such practices obviously do little for fish quality. But it was in retail stores where she most often found practices that put fish quality at risk. Consider the case of catfish.

Our reporter visited processing plants in Mississippi, which supply some 70 percent of the catfish sold in U.S. retail markets. She found the plants clean, modern, and operating under a voluntary inspection program run by the U.S. Department of Commerce.

Workers cutting the fish into nuggets and fillets appeared to follow good manufacturing practices—wearing gloves, hair covers, and aprons, and dipping their hands in a disinfectant whenever they entered the processing room. Furthermore, the catfish was hauled live to the plants from nearby ponds in tank trucks. It was never out of water before it hit the conveyor belt that whisked it to the processing room.

We could not check the bacteria counts on fish leaving the processing plants, but Dr. Gladden Brooks, a food science specialist at Mississippi State University and an adviser to the catfish industry, told our reporter that catfish fillets could be expected to have bacteria counts between 50,000 and 100,000 when they leave the plant. With those counts, he said, the catfish should last seven to eight days.

If that's the case, something went awry on the trip north or after the fillets had reached the supermarket. Most of the catfish we bought was past its prime, with bacteria counts exceeding 27 million. "When you get a count of 2 million, something is terribly wrong," says Brooks.

Part of what is terribly wrong is the temperature to which fish is subjected. Although fish should be stored at temperatures between 30°

and 32°, state health codes allow temperatures in retail display cases as high as 45°. That temperature is sufficient for controlling disease-causing bacteria, but not the bacteria that lead to spoilage. "Storage temperatures are way too high," says Dr. Robert Price, a seafood technologist at the University of California. "We've found them as high as 51°."

Other retail practices allow fish to get too warm. More often than not, we found fillets in display cases piled on top of one another. Those at the top of the heap are, of course, warmer than those sitting on the ice at the bottom.

At a Foodtown store in the New York area, where fish fillets were piled high, bacteria counts were also high. Counts exceeded one million on four samples from that store. Two samples had counts greater than 27 million, and two were contaminated with fecal coliforms exceeding 600 per gram.

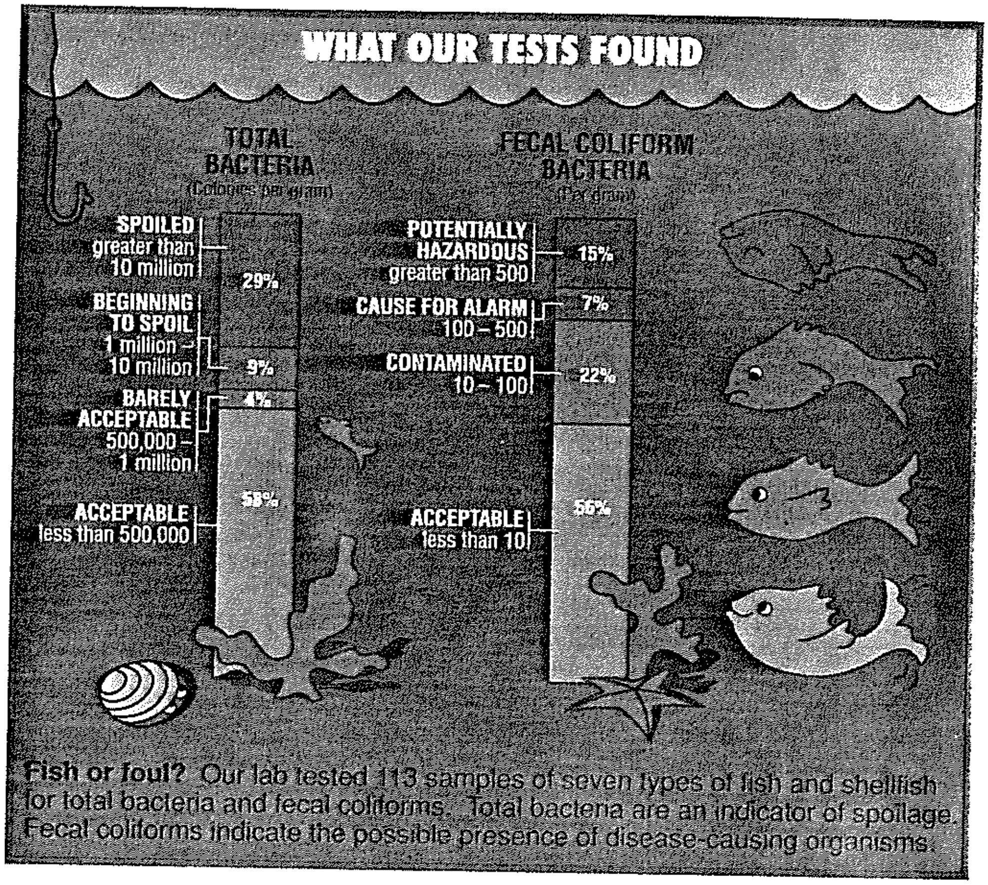
At a Dominick's store in the Chicago area, we found swordfish sitting directly under the hot lights illuminating the display case. The clerk said the fish had been on display for two days. The bacteria count proved it. It exceeded 27 million.

It would seem axiomatic that stores selling fresh food must be clean. But cleanliness came up short in many stores we visited. As we approached their seafood counters, fishy odors were commonplace, indicating that either the display cases hadn't been adequately cleaned or the fish was very old.

Last summer, at Rhim's Fish Market, a small specialty fish store in Manhattan, flies buzzed about the fish, and the fly catcher looked as if it hadn't been cleaned in years. The state of the fish matched the state of the store. Flounder and salmon samples that we bought there had fecal coliform counts exceeding 200 per gram.

At a specialty fish store in the New York City borough of Queens, the cutting board smelled bad and looked as if it hadn't been cleaned in recent memory. New York State food laws require retailers to clean their equipment at the end of each day. Swordfish and salmon we sampled from that store had bacteria counts exceeding 1.7 million and fecal coliforms exceeding 600 per gram.

A clerk at a Pathmark store in the metropolitan New York area was cutting shark steaks with a knife covered with fish blood and mucus. When he finished, instead of washing the knife, he stuck it into the ice where other fish were displayed, potentially contaminating them with bacteria from the shark.



Fish or foul? Our lab tested 113 samples of seven types of fish and shellfish for total bacteria and fecal coliforms. Total bacteria are an indicator of spoilage. Fecal coliforms indicate the possible presence of disease-causing organisms.

Chart by Jean Wisenbaugh

Even the most attractive display case may harbor dangerous bacteria. Retailers know that fish must look good if it's going to sell, and one way to make it appetizing is to display it with cooked seafood products, usually salads garnished with lemons and greens.

State food laws prohibit stores from displaying any raw food next to cooked foods because disease-causing organisms from the raw product might be transferred to the cooked. Yet in store after store, we found cooked shrimp and herring, squid, and surimi salads sold next to raw fish fillets and steaks.

At a Lucky store in California, cooked shrimp was actually touching raw salmon steaks. At a Jewel store in the Chicago area, the spoon from the herring in cream sauce was poking the scrod, and cooked shrimp was just about hugging the perch. At another Jewel, the bowl holding the herring salad brushed against the red snapper. At a fish market in Manhattan, squid salad was served from a bowl surrounded by an assortment of raw fish.

Such practices not only violate state health codes but, in many cases, a store's own policy. Wakefern Food Corp., the distribution and merchandising company for ShopRite stores on the East Coast, says it trains store personnel to separate cooked and raw fish. Yet at one ShopRite, our reporter found some over-the-hill flounder residing next to cooked shrimp and a surimi salad.

Getting fresh

In many stores the catch of the day might better be called the catch of the week. Some fish simply had been displayed too long. Many of the fish fillets we saw were tired, dull, dry, and gaping, with none of the translucence characteristic of fresh fish. In Chicago, for example, the fresh tuna sold in several supermarkets was greenish-brown and dull, suggesting the fish had been sitting around for several days.

One Thursday, at a Dominick's store in metropolitan Chicago, we bought Dover sole that the clerk said had come in on Monday. The "pull date" on the package noted it could be sold until Saturday. When we bought it, the quality had already vanished. Its total plate count approached 8 million.

At an Omni Superstore in Prospect Heights, Ill., we tried to buy lake whitefish, but the clerk dissuaded us. "You wouldn't be happy with it," he said. So why was it in the case? "It's just filling space in the display," he

Fresh vs. Frozen

WHAT LURKS IN THE FREEZER CASE?

Frozen fish can have better flavor and texture than "fresh" fish that has spent several days journeying from sea to supermarket.

Rapid freezing causes fish to freeze uniformly, and that minimizes the loss of flavor and texture. The term "IQF"—for individually quick frozen—designates fish that have been fast-frozen. Halibut, catfish, and shrimp, for example, are often available as IQF products.

To buy good-quality frozen fish, you really need to know when they were frozen and how they were stored. But except for a label indicating the fish was frozen at sea, consumers have no way of learning whether a fish was frozen on the boat or after an unsuccessful stint in the supermarket's display case.

Examining the packages in the freezer case, however, will give you some clues about how carefully the fish has been stored. Much of what we saw was freezer-burned and coated with ice crystals, indicating either that someone had allowed the fish to thaw and freeze again (and possibly again) or that it had been improperly packaged. Sometimes the fish was mushy—a sign that it had thawed and was at that moment freezing again.

Icy, and dicey These frozen fish won't make the tastiest meals. The fish on top may have thawed out and then slid to one end of the package. It's also coated with ice crystals. Part of the fish in the lower package had poked through the plastic wrap.

At a ShopRite store in the New York area, for example, we found lobster tails that were totally freezer-burned. A portion of the meat was completely dried out. Frozen mussels in the same store were almost totally thawed out, and the halibut was covered with ice crystals.

At a Waldbaum's store in the New York area, crab legs were sticking out of a broken package, and at an Omni Superstore in Prospect Heights, Ill., much of the whitefish was freezer-burned, dried out, or exposed to air through holes in the package.

What to do? Check for signs of freezer burn—light colored, cottony spots. Also look for clues of rancidity—yellow discoloration of the fish's fatty areas as well as a rancid odor. Watch for ice crystals and broken wrappers. Sniff the package. If you detect a fishy odor, that could mean spoilage had set in before freezing or that some bacteria continued to grow even while the fish was frozen.

replied. And all the while possibly contaminating the ice and newer fish that might come in.

Because fish has the reputation for being a quick spoiler, the first questions consumers usually ask are: Is it fresh? Did it come in today? Retailers go to great lengths to tell their customers "yes," even if it means deceiving them.

To consumers the word "fresh" means fish right out of the water, fish that has not begun to spoil. To the industry "fresh" means fish that has never been frozen. As long as fish has never seen the inside of a freezer, it can be out of the water for days and still be called "fresh."

Cub Foods in the Chicago area advertises, "With Cub's 'Fish in a Flash,' you always get the freshest taste because we fly fish and seafood in overnight from the shore. That's how we know our fish are the freshest and that you'll have great tasting seafood every time." We bought sole at a Cub Foods store in Lombard, Ill., on a Thursday. A clerk told us it had come in on Tuesday. When we tested it, its bacteria count exceeded 27 million.

To give the impression that their fish is fresh, retailers often thaw fish that would have been better off had it remained frozen. Much of the orange roughy we saw was sold thawed out, even though most of it is imported frozen from New Zealand. At an A&P in the New York area, we inquired whether the orange roughy was really fresh. The clerk said it was "frozen fresh," but "just came in today."

A clerk at a Dominick's store in the Chicago area also told us the orange roughy he was selling was "fresh frozen." When pressed, he offered a truly baffling explanation: "Fresh frozen is a play on words. It wasn't old so it was fresh, and it had been frozen once, so it was frozen fresh."

Other retailers simply stuck signs on the fish saying it was "fresh" when it had actually had been frozen. Still others use a hodgepodge of signs that give the general impression that *all* the fish in the case is fresh.

A Safeway store in California covered all bets. One sign read: "Fresh Bay Scallops, pre-frozen—$7.99."

Who's watching the store?

Although the Federal government inspects all beef and poultry plants, there is no mandatory inspection of seafood. Fish processors, wholesalers, and retailers can, however, pay to have inspectors from the U.S. Department of Commerce observe conditions in their plants or stores. They then receive seals of approval if their facilities meet certain standards.

Fish wholesalers and retailers can pay for different levels of inspection, each with its own seal. Just over 10 percent of all processors currently participate; they account for about 18 percent of all fish Americans eat annually. Here is what the seals mean:

- **Lot inspection** means that inspectors eyeball a batch of fish to check it for conformity with specifications set by the company requesting the inspection. An inspector may look over the lot for net weight and uniformity in size and color, or simply to be sure the proper number of fish have been shipped. Lot inspection doesn't mean that an inspector approves or even looks at every piece of fish.
- **Packed Under Federal Inspection (PUFI)** labels mean that the seafood products have been processed in the presence of Federal inspectors in Federally approved plants. The Government allows the use of this seal if the products are safe, clean, wholesome, and properly labeled when they leave the plant, and if the plant and its workers meet certain sanitation and hygienic stan-

dards set by the Government.

■ **U.S. Grade** marks mean the products have been processed under Federal inspection and meet certain quality standards. The Government has established grade standards for a variety of fresh and frozen fish products. The U.S. Grade A mark, for instance, indicates the fish is relatively free from blemishes and defects, is in excellent condition, and has good flavor and odor.

Stores subscribing to the Government programs tout these seals of approval to help sell their fish. But the fact that a fish may have passed under the nose of a Government inspector doesn't mean it's of high quality when it finally reaches the consumer's shopping cart. A clerk at the Chicago Fish House, one of that city's premier seafood wholesalers, told us that a Government inspector is "present 24 hours." Yet clams and sole we purchased at its retail shop had total plate counts exceeding 27 million. The clams presented a possible health hazard if eaten raw.

ShopRite stores we visited sported signs near the fish case promoting their Grade A fish. Our reporter visited the company's processing plant and found it cold, clean, and modern. But some of the fish she saw in ShopRite stores was tired and dried out and didn't look like top quality, as implied by the Grade A shield.

The Jewel stores in the Chicago area advertise that their fish are "federally lot inspected." At one store, a package of mahi-mahi was even labeled "U. S. G. Insp.," giving the impression the fish had been checked by a Government inspector. In fact, there's no official seal known as "U. S. G. Insp." We didn't send that sample to our laboratory, but opened the package and inspected it ourselves. The fish was dried out, gaping (the fibers were pulling apart), and sprinkled with dirt and debris.

At a Treasure Island supermarket on North Clybourn Avenue in Chicago we found some packages of sole and perch labeled "USDA govt inspected." The U.S. Department of Agriculture inspects beef, pork, and chicken. It does not inspect fish.

States, too, play a role in fish inspection. The New York Department of Agriculture and Markets says it inspects each retail food store at least once a year, but some small stores may be inspected only every two years. In Illinois, local health departments, following rules set by the Illinois Department of Public Health, check on supermarkets and retail fish stores twice each year. If they find violations, inspectors return to see whether they have been corrected. Under each state's Freedom of Information Act, we requested inspection reports for the stores we visited.

In New York, inspectors had noted violations that ranged from dirt-encrusted walls to a lack of hot water in employee bathrooms. Sometimes violations paralleled conditions we observed.

For example, at Rhim's Fish Market in Manhattan, where we saw flies buzzing about the fish, the state's inspector noted that the front door did not have a proper screen. But that was more than two years before our visit.

Rosedale Fish Market, a fancy seafood shop on Manhattan's East Side, sold us clams with levels of fecal coliform bacteria that indicated a potential hazard. State inspectors had repeatedly noted poor hygiene on the part of employees there. The store also makes and sells prepared seafood dishes. But at the time the store was inspected, it didn't have the necessary license to do so. In fact, inspectors had cited the store at least three times for not having the license, but the store kept cooking.

In Illinois, some stores also may be ignoring the recommendations of local health inspectors. For example, inspectors told a Cub Foods store in Arlington Heights that the "fish was too warm" and to train employees to check fish.

But a year after their report, we found the store selling whitefish, sole, and catfish with bacteria counts over 27 million and clams with fecal coliforms that were almost 11 times higher than the accepted safety guideline.

At the Chicago Fish House, another store that sold us potentially dangerous clams, inspectors had repeatedly noted deficiencies in the handling of shellfish. In one report, inspectors ordered the store to stop storing fresh clams under boxes of fish that were dripping blood.

What's a shopper to do?

Go to a reputable fish store and ask questions. That's the advice we got from Thomas Billy, director of the FDA's newly created Office of Seafood, which is likely to play a large role in monitoring seafood in the future.

We took that advice and still got bad fish. We found little difference between the fish sold by so-called specialty fish stores and that in ordinary supermarkets. Poor handling and too-warm temperatures were everywhere.

When we asked questions, the answers were not reassuring and often wrong.

Other common advice is to know where your fish comes from. If you could find out, that might help you avoid fish contaminated with chemicals or heavy metals. Take flounder, for example. Half of our New York samples contained pesticide residues, most likely because they were caught near shore, where pesticide levels are higher.

But, in reality, it's impossible to learn whether the flounder you're considering was caught near shore or far out at sea. At a Grand Union store in the metropolitan New York area, a shelf tag on the flounder simply read: "North Atlantic waters."

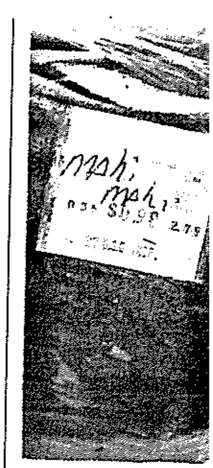
When we asked at a Lucky supermarket in California where the scallops came from, a clerk replied: "the ocean." At a Grand Union store in the New York area, we learned that the catfish came from "the warehouse in Mt. Kisco, N.Y."

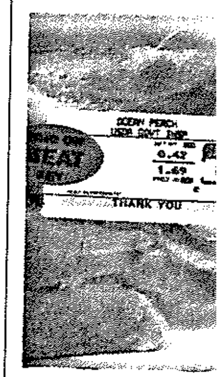
Most states require that stores make available to public health officials and consumers the tags (or the information on them) that show who shipped a particular batch of shellfish and when and where it was harvested. Retailers must keep the tags available for inspection for 90 days after the shellfish is sold. "The tag is an assurance for consumers that the product was packed under the Shellfish Sanitation program," says the FDA's Thomas Billy.

In New York, however, we had trouble obtaining the tags for our clams. At a Pathmark store in the New York area, a clerk became defensive and demanded to know why we wanted it. Finally, he showed us part of the tag that identified the shipper. But when we asked where the clams came from, he shouted "certified waters," and gave no further information.

At Yaohans, a Japanese supermarket in Edgewater, N.J., the clerk told us the tag for the clams we purchased was missing. Nevertheless, he produced a tag from another batch. We can't be sure it matched our clams.

Our reporter called some of the stores where we bought clams and asked for tag information within the time period retailers must keep it on





Suspect seals The label "U.S.G. Insp." appears on the top package of mahi-mahi. There's no such label authorized by the U.S. Government. The bottom package of ocean perch claims the fish was inspected by the U.S. Department of Agriculture. The USDA doesn't inspect fish. For a look at some authentic labels, see page 113.

file. An employee at the Central Fish Market in Manhattan said: "We keep them a couple of weeks. After a month we throw them away."

In Illinois, retailers were more cooperative. But some of their information was suspect. On August 20 we bought clams from a Cub Foods store in Arlington Heights. The tag we received said the clams had been plucked from Chesapeake Bay that very day. Even if they flew in on the Concorde, it's hard to see how they could have been packed, shipped to a wholesaler, and then repacked for Cub Foods—all before we picked them up that morning.

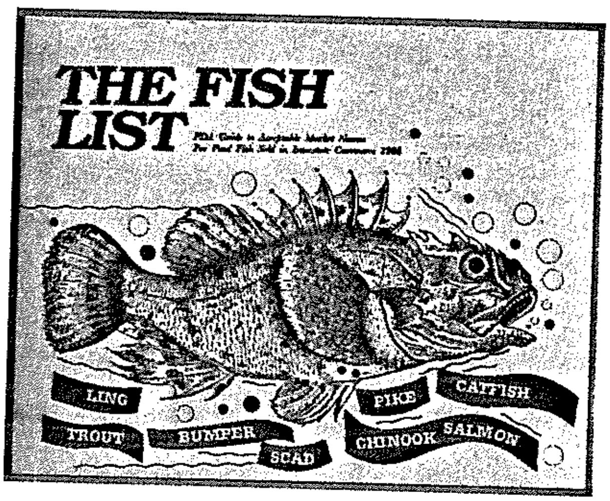
The tag at a Dominick's supermarket in the Chicago metropolitan area seemed to have come through a time warp. It said the clams were harvested from Mobjack Bay in Virginia on August 23. We had bought them on August 21.

THE LABEL SAID SNAPPER

THE LAB SAID BALONEY

When you buy seafood, you probably expect the fish in the package to match the name on the label. But that's not what we found when we bought fish for our species-identification test. About one-third of our samples turned out to be mislabeled. Though the labels promised swordfish, red snapper, sole, flounder, redfish, whitefish, bluefish, and scrod, the lab told us the labels lied.

"The typical consumer doesn't realize when one species is substituted for another. If it doesn't taste as good, they are likely to think [simply that] the quality is not what it should be," says Joseph Ferrara, assistant director of the food safety and inspection division at New York's Department of Agriculture and Markets.



Who's who in fishdom The FDA's Fish List is the last word when it comes to fish names. The list includes 1041 species of fish.

To sort out the myriad monikers that fish go by, the FDA in 1988 published the Fish List, the last word when it comes to fish names. For each of 1041 species, the list identifies the market, scientific, common, and regional name. The list is supposed to eliminate confusion and reduce mislabeling. But, as we found, it has barely begun to dent the problem.

We bought 97 samples of finfish and shellfish from retailers in metropolitan New York, metropolitan Chicago, and in the San Jose-Santa Cruz area of California. We sent those samples to the National Seafood Inspection Laboratory in Pascagoula, Miss., for identification.

There, chemists compared the proteins in our fish with those found in a reference fish that was known to be the same as the one listed on the package label. If the proteins in our fish did not match those of the reference sample, we knew our fish was mislabeled. Only 29 percent of the fish we analyzed matched the labels on their packages; 31 percent were definitely mislabeled. The lab couldn't tell us whether the remaining 40 percent were correctly or incorrectly labeled. It either had no reference standard or the protein bands were too similar to distinguish between closely related species. For example, the lab could identify salmon as salmon and tuna as tuna, but couldn't tell whether it was in fact silver salmon or bluefin tuna as the labels had claimed.

That's significant because certain species of salmon or tuna fetch more at retail. Silver salmon and bluefin tuna sell for a lot more than pink salmon or yellowfin tuna, which are the hamburger of the salmon and tuna families. Consumers have no assurance they're getting filet mignon and not ground chuck.

Snapper snafus

Only one species of fish—*Lutjanus campechanus*—can officially be called red snapper. It lives along the Atlantic coast off Florida and in the Gulf of Mexico off Louisiana, Texas, and northern Mexico. It's a scarce fish, commanding a high price in the marketplace. Retailers in the New York area sell a whole red snapper for $7.99 to $14 a pound, depending on the neighborhood.

Other snappers, which are found off the coasts of South America and in the Pacific Ocean, are less desirable. In New York City, they sell for as little as $3 to $4 a pound.

Retailers capitalize on red snapper's cachet. To see whether red snapper was really red snapper, we sent the lab eight packages labeled "red snapper," two packages labeled "Pacific red snapper," one package labeled "West Coast snapper," and two packages labeled "scarlet red snapper."

The lab told us only one of the first eight packages contained red snapper. Neither of the packages labeled Pacific red snapper contained Pacific red snapper. The package labeled "West Coast snapper" contained no such animal. The lab couldn't judge the "scarlet" red snappers because it had no official standard for them.

The only accurately labeled red snapper we found was at Burhop's Quality Seafoods, a fish store in Glenview, Ill. There it sold for $13.95 a pound. Also in the Chicago area that week, we bought alleged red snapper at three Jewel supermarkets and at one Omni Superstore. The fish sold for $4.19 per pound at Jewel, and only $3.98 at Omni.

Sole mates

Eight of the 14 samples of the sole we bought were also mislabeled. Grey sole wasn't grey sole, lemon sole wasn't lemon sole, petrale sole wasn't petrale sole, English sole wasn't English sole. A fish called Queen Charlotte sole was a complete mystery; it isn't even mentioned in the Fish List.

Those fish could have been any

one of the 57 species of flat white fishes that the Fish List identifies as sole, sole/flounder, or flounder. Our unknown soles were pricey, selling for as much as $10.99 a pound. If the retailer was substituting a cheaper flat white fish, consumers wouldn't be the wiser.

Another mystery came in packages labeled Dover sole. In the U. S., most Dover sole is a cheap, inferior-quality fish found off the West Coast, not to be confused with the prized European Dover sole, which is caught in North Sea waters. When available, European Dover sole commands high prices—$12 to $18 a pound at retail. Two packages labeled Dover sole that we bought were not even the cheap West Coast species. It's hard to imagine what fish retailers were substituting, but whatever it was, they got a good price for it. At a Safeway in California, our misbranded Dover sole was selling for $5.69 per pound. At a ShopRite in metropolitan New York, it went for $4.99.

Getting scrod

Scrod is a young cod, haddock, or pollock. It is not a species recognized by the Fish List. A few retailers correctly identify their fish as "scrod cod," but they are the exception. Most simply label the packages "scrod." We sent two packages of alleged scrod to our laboratory. The lab couldn't identify one package. The other turned out to be Alaska pollock. If scrod is a young fish, it's hard to say what "baby scrod" is. Last fall, the Jefferson Market, a well-known fish retailer in Manhattan, was selling it for $5.98 per pound.

Salmon shenanigans

In store after store we found salmon steaks and fillets labeled "Norwegian salmon." But there's no such species, according to the Fish List. Because the Norwegians were first in the U.S. market with good-quality, farm-raised salmon, they convinced wholesalers, retailers, consumers, and chefs to equate Norway with quality. The name Norwegian salmon stuck and is now attached not only to fish from Norway, but to those from Maine, Canada, and Chile. Today, in fact, Norway is no longer a major source of "Norwegian" salmon in the U.S.

Last spring, the International Trade Commission, acting on a complaint from Maine salmon farmers, ruled that Norwegians were dumping their salmon in the U.S. market—that is, selling the fish for less than it cost them to produce it.

The Commission imposed a tariff averaging 26 percent, which has priced most Norwegian salmon out of the market. That doesn't stop retailers, however, from selling "Norwegian" salmon, and perhaps jacking up the price a bit to make consumers believe their fish is Norwegian-raised.

Confusion doesn't stop with a salmon's national origin. Retailers, particularly in Chicago, advertise and sell "silver brite" salmon. Silver brite is not a species recognized by the Fish List, but a term that describes the skin color of chum salmon when they're caught in the ocean and their skin is still silvery bright.

It's easy to see why retailers prefer the name silver brite. Silver brite has more sales appeal than the humble chum, a fish that is also low on the salmon quality totem pole.

Ask the clerks?

Since package labels are often unreliable, are the clerks at the fish counter better able to tell you what's in the package?

A clerk at a Dominick's supermarket in metropolitan Chicago admitted that clams labeled "cherrystones" were not really cherrystones. They were "topnecks," he said. He explained that he did not have the right label, but he had to call them something.

At a Jewel store in metropolitan Chicago, the man behind the fish counter told us the kind of salmon offered for sale was called "brie"—as in the cheese. He thought for a moment, then corrected himself. No, he said, "it is brite—brite salmon."

His knowledge of other fish was similarly limited. When we asked what kind of snapper was in the display case, he replied: "a mild fish."

At a Lucky supermarket in California, we wanted to know if the Dover sole was the European variety. The clerk assured us it was, although its $4.28-per-pound price suggested that it was caught closer to home, perhaps in nearby Monterey Bay.

Read the signs?

You can also read the signs posted around the display case and hope they shed light on the fish you're buying. But, in our experience, the signs are just as likely as the package labels to keep you in the dark.

At Burhop's, the specialty fish store in Glenview, Ill., that sold us the only real red snapper we found, a sign near the fish said that it had come from Hawaii. We asked the clerk behind the counter, just to be sure. He said the snapper came from Florida, which was probably right since red snapper does live in the waters off the Florida coast, but not near Hawaii.

The blackboard behind the counter at an A&P in metropolitan New York told customers that the salmon it offered for sale was "fresh Norwegian salmon steak." Knowing there was little Norwegian salmon around, we inquired further. The clerk said that the salmon was really from British Columbia.

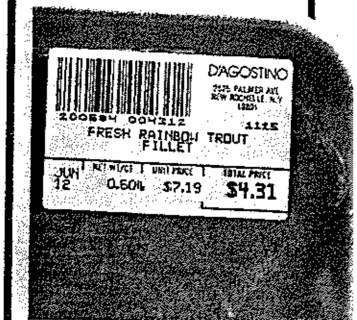
At Cub Foods in Lombard, Ill., a label next to the salmon steaks identified them as Atlantic salmon. However, the blackboard near the display case contradicted the label. It said the salmon sold that day was "king salmon from Alaska"—a different species, and a different ocean.

Rely on the FDA?

Fish that doesn't match the package label is misbranded, according to the Federal Food, Drug, and Cosmetic Act. The FDA can seize the fish and destroy it. The FDA's Fish List also frowns on calling fish by their regional names and warns that using them "may cause the fish to be misbranded."

However, as far as fish labeling is concerned, the FDA rarely takes legal action against anyone for using the wrong fish name, regional or otherwise. In the last three years, the FDA has made only three seizures of fish that were mislabeled.

Although the agency says it may have sent warning letters to other violators, it couldn't tell us how many such letters were sent. Mislabeled fish take a back seat to more pressing regulatory problems. "You wouldn't want us to spend our time seeing that red snapper is properly labeled and ignore botulism in tuna," says Mary Snyder, chief of the policy



Mystery packages
We bought these packages labeled "rainbow trout" and "bluefish" and sent them to the National Seafood Inspection Laboratory for analysis. The lab said neither fish matched its label.

Handwriting on the walleye?
Be suspicious of handwritten labels on packages of fish. A noticeable portion of our mislabeled fish bore labels written by hand, rather than printed by machine.

and guidance branch at the FDA's Office of Seafood. "We go after blatant violators and hope to set an example."

State regulators are also supposed to keep an eye on food labeling in supermarkets. We didn't find them overly concerned about counterfeit fish. Many state agencies have barely enough money to conduct sanitation inspections, let alone worry about fish labels. In New York, food inspectors don't even look for misbranded fish at every routine inspection.

In Illinois, inspectors from local health departments inspect retail grocery stores. They don't look for mislabeling, either. Says Kerry O'Shaughnessy, a health inspector for the village of Glenview, "I know red snapper has kind of reddish skin, but I couldn't tell you if the store substituted something else."

WHAT ELSE IS IN FISH? AND HOW DID IT GET THERE?

The waters where fish live are often dumping grounds for potentially harmful chemicals that have been used on land.

Once in water, these substances make their way into the sediments at the bottom and into aquatic plants and animals at the base of the food chain. Little fish eat plants and little animals, bigger fish eat the little fish, and so on up the food chain. Fish also absorb these substances directly from water that passes over their gills. Older fish, predatory fish, and fatty species of fish accumulate more such substances in their tissues than younger, smaller, or leaner ones do.

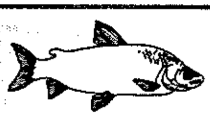
Although the Environmental Protection Agency banned polychlorinated biphenyls (PCBs) and most chlorinated hydrocarbon pesticides in the 1970s, some residues that were released into the environment before these compounds were banned still remain. They do not decompose easily, so they linger in the water sediments and in the tissues of fish and humans for years.

In addition to our lab tests for bacteria, we analyzed all of our fish samples for PCBs, mercury, and for a long list of pesticides. We also looked for lead, cadmium, and arsenic in clams.

Forty-three percent of our salmon, 50 percent of our whitefish, and 25 percent of our swordfish contained detectable levels of PCBs. Ninety percent of the swordfish also contained detectable amounts of mercury. In some of these fish, the levels we found were significant, posing a possible health hazard to developing fetuses.

Here's a rundown of what our laboratory tests found:

WHAT ELSE WE FOUND

Fish	Key findings
 SALMON	Forty-three percent of our samples contained PCBs, a potential carcinogen and reproductive hazard.
 SWORDFISH	Ninety percent contained mercury, which may harm the nervous system. Twenty-five percent contained PCBs.
 CATFISH	An occasional sample contained residues of the pesticides DDT, DDE, and DDD, which can affect reproduction in mammals.
 CLAMS	Some samples were high in lead, which can impair behavioral development in young children.
 LAKE WHITEFISH	Fifty percent of our samples contained PCBs. Some contained traces of pesticides.
 FLOUNDER, SOLE	Our flounder and sole were virtually free of pollutants. Fifty-five percent had no detectable residues; the rest, barely detectable.

PCBs

PCBs are synthetic liquids that were once used in electrical equipment, hydraulic fluid, and carbonless carbon paper.

PCBs promote cancer in laboratory animals, but researchers now believe that a greater hazard may be their effects on human reproduction. One study of women who ate fish contaminated with PCBs from Lake Michigan found they gave birth to smaller babies with significant developmental problems. These women reported eating fish for several years before they conceived.

By far the biggest source of PCBs in the human diet is fish, particularly fatty species, such as salmon. Like humans, all fish have PCBs in their tissues, but some have more than others. The concentration of contaminants in fish is related to the waters they live in.

The FDA established an official tolerance of 2 parts per million for

Text continued on page 114

WHY DOESN'T THE U.S. INSPECT MORE FISH?

In 1967, soon after Congress put the finishing touches on the Wholesome Meat Act, Michigan Senator Philip Hart introduced a bill that would have required the same kind of Federal inspection for seafood.

Senator Hart, along with consumer advocate Ralph Nader and representatives of organized labor, wanted to station Federal inspectors in every fish-processing plant. But the fish industry and its allies in the Congress and the Nixon Administration pressed for spot-checking rather than "continuous inspection."

"Fish needs the same kind of inspection as meat and poultry because it can carry just as many disease-causing organisms," Hart argued at the time. Although he held hearings in 1967, 1968, 1969, 1971, and 1974, no bill requiring seafood inspection ever passed. When Hart died in 1976, his push for fish inspection died too.

Fish inspection was largely a dormant issue through the 1980s. Then in 1990, the U. S. Senate and the House both passed bills requiring mandatory inspection of all fish-processing plants. Each house, however, had its own idea of how fish should be checked, and neither bill became law.

The big hang-up this time was which Federal agency should monitor the nation's fish supply. The fish processors pushed for the U.S. Department of Agriculture to get the job. But some consumer groups, including CU, preferred that the Food and Drug Administration inspect fish. The Agriculture Department's historical coziness with industries it regulates, plus its recent attempts to weaken its own regulatory authority over meat and poultry, didn't bode well for strong fish inspection.

In the meantime, the FDA has assumed the role of chief seafood cop. "We think we have an outstanding mandatory fish inspection program," says Thomas Billy, director of FDA's newly created Office of Seafood. "Under the Food Drug and Cosmetic Act, we have authority to inspect every seafood plant in the country."

Starved for money

In CU's view, the FDA's "mandatory" program falls short. The FDA has authority to inspect every seafood plant. But starved for money, it has used that authority sparingly, inspecting plants once every four years on average.

The FDA can't compel the seafood-processing plants it inspects to keep records of such things as temperatures and storage conditions, which would help the agency monitor fish safety. Nor does it inspect fishing vessels or retail fish stores, both significant problem areas in the handling of fish.

We also discovered big holes in the shellfish sanitation program, which the FDA supervises. Not only did we find clams with high levels of potentially harmful bacteria, but we also found that stores were not complying with rules for keeping identification tags, a cornerstone of shellfish regulation.

Furthermore, it's hard to have much confidence in the agency's surveillance of chemical contaminants in fish. In 1989, the FDA checked only 1604 fish samples for contaminants. In contrast, the same year the U.S. Department of Agriculture checked 185,000 samples of meat and poultry. The FDA has monitored swordfish for methylmercury since 1970 and recently started monitoring shark as well. But its testing for PCBs in salmon is particularly inadequate. Of 143 samples the agency tested in a recent three-year period, most of the domestic samples were from the Great Lakes—an incomplete picture of the salmon Americans eat.

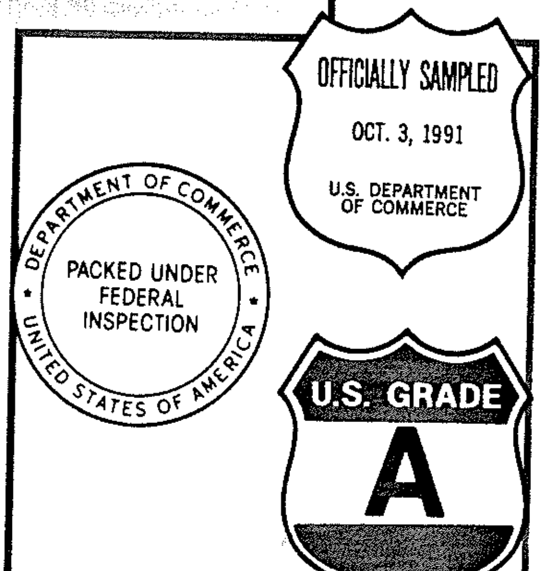
Skimpy fines

Local and state health departments also have a hand in monitoring the nation's fish. But a lack of money for frequent inspections and skimpy fines levied against retailers caught violating state health codes do little to deter unsanitary practices or to improve fish quality.

For their part, some supermarket chains are working with the Federal government to develop a voluntary program to check fish. The supermarkets that abide by the program's requirements can earn a seal of approval that will assure consumers that the fish has been handled properly. That seal is not yet in stores.

CU believes consumers deserve more than that. They need a strong program that addresses the microbial and chemical contamination of raw fish. Much of the inspection in place today focuses on visible plant or store deficiencies, such as dirty walls and floors and the lack of paper towels in employee restrooms. While important, these problems have little to do with whether a fish is laced with PCBs or methylmercury or whether disease-causing bacteria are present.

Any program must also focus on quality. Americans are eating and should eat more fish because it is a healthy alternative to beef and pork. One way to improve quality is to mandate better temperature control, especially in retail stores. Not only must inspectors be more vigorous in policing the temperatures in display cases, but states should consider changing their food laws to require fish be kept at temperatures lower than those now permitted.



Real seals These seals are issued to processors and retailers by the U.S. Department of Commerce. The top one indicates that a batch of fish was inspected as a group. The Packed Under Federal Inspection mark indicates the fish was processed in a Federally approved and supervised plant. The Grade A mark indicates the fish has met certain quality standards.

PCBs in 1979. The tolerance is the agency's basis for taking legal action and destroying contaminated samples of fish.

Although most of our samples were within the tolerance levels set by the FDA and would have passed the agency's inspection, that's scant comfort. As PCBs linger in the environment, their composition changes, and they gradually become more toxic. These "weathered" forms of PCBs are more toxic than those forms tested in studies on which the tolerance was based. And these more toxic forms are likely to be found in fish.

Advised, but not advertised States collect samples of fish from local waterways to test for contaminants. If a body of water is particularly polluted, states issue advisories, generally aimed only at sports fishermen. We found advisories inconsistent from state to state, often offering different advice about the same fish from the same waters.

Sygma Photo News-Patrick Forden photographer

Furthermore, the FDA set its tolerance before the hazards to human reproduction were documented, at a time when people were eating less fish, and before the toxicity of PCB breakdown in the environment was known.

The last factor is especially significant, since PCBs accumulate in body tissue. The PCBs that you eat today will be with you decades into the future.

Given these facts, we think even 1 part per million of PCBs in fish is too high. Our laboratory detected levels ranging from 0.2 to 2.1 parts per million in our whitefish, swordfish, and salmon. Three out of 10 samples of whitefish contained PCBs exceeding 1 part per million; three out of 20 samples of swordfish did.

Seven of 10 salmon samples we purchased in New York contained PCBs ranging from 0.7 to 1.3 parts per million. Thirty percent of the samples from Chicago had detectable levels, ranging from 0.2 to 0.8 parts per million.

Some of our Chicago salmon samples were probably species from the West Coast, at least that's what the store clerks told us. Those salmon may have come from less-contaminated waters than fish from the Atlantic or the Great Lakes, the possible sources of fish we purchased in New York. However, because the package labels, store clerks, and signs were not always believable, we couldn't tell for sure where our fish was from.

Nor could we tell whether it was "farm-raised," as some salmon is. Just because salmon is farm-raised doesn't mean it's contaminant-free. Farm-raised fish spend part of their time in pens in the ocean. Their diet also consists of manufactured feed, which is based largely on fish that may have contained PCBs.

Mercury

Mercury is a poisonous metallic element that is released by burning fuels as well as by industrial and household wastes. Eventually it settles in waterways and oceans where it joins naturally occurring mercury. There, bacteria convert it to the toxic compound methylmercury.

Methylmercury is a poison that affects the development of the nervous system. Unlike PCBs, which linger in the fatty tissues of humans for many years, mercury eventually leaves the body, usually within two years, provided you stop ingesting it.

Mercury accumulates in large fish that live a long time, such as tuna, shark, and swordfish. Almost all of the mercury in fish is the compound methylmercury. The FDA has set an informal action level of 1 part per million for methylmercury in fish.

Ninety percent of our swordfish samples had detectable levels of total mercury, ranging from 0.46 to 2.4 parts per million. The average of those samples was 1.14 parts per million. Forty percent contained mercury that exceeded the action level.

The high levels of mercury we found in swordfish are not surprising, since mercury is present in oceans throughout the world. There's no way to prevent swordfish from accumulating it in their tissues.

The FDA told us, however, it is "actively reevaluating the action level for methylmercury," a step in the right direction. The Canadian Health Protection Board has a lower standard for mercury in fish—0.5 parts per million. Eight-five percent of our swordfish samples would have exceeded the Canadian limits.

Pesticides

Residues of pesticides used on farms and forests, and for mosquito control ultimately find their way into rivers and oceans. There they remain for many years. For example, although the EPA banned the use of DDT in 1972, several of our fish samples had measurable levels of DDT and the products it creates when it breaks down—DDD and DDE—in their tissues.

DDT and its breakdown products, as well as the pesticides dieldrin and endrin, can all affect the human nervous system. DDT, DDE, and dieldrin have also caused liver tumors in rodents, and all of these pesticides affect reproduction in mammals.

The FDA has set an informal action level of 5 parts per million for DDT in fish and 0.3 parts per million for dieldrin and endrin.

Two of our samples, one of catfish and one of sole, contained more than 6 parts per million of DDE. Several others, notably catfish, had lower levels of DDT and its breakdown products. The presence of DDT in catfish is not surprising, since they are often raised in ponds on land once used for agriculture.

Our lab reported levels of the pesticide dieldrin over the action level for two samples of lake whitefish and levels of endrin from 0.1 to 0.2 parts per million for four samples of swordfish, salmon, and flounder.

The species most free of pesticides were flounder, sole, and clams. We detected no pesticide residues in half of our New York flounder samples; the other half contained only trace amounts. Six of the 10 sole samples purchased in Chicago had no detectable levels of pesticides; the others contained levels of DDE ranging from a trace to more than 6 parts per million.

DDT and its breakdown products are widely dispersed in the environment and will show up in the human diet for decades to come. While its use has been banned in the U.S., DDT is still used in other countries. However, since only an occasional sample of our fish had significant pesticide residues, the overall hazard from this group of contaminants appears relatively low.

What's in clams?

We found no measurable levels of pesticides in clams. But a number of our samples had relatively high levels of arsenic and lead. The hazards posed by arsenic in shellfish are not clear. Lead, even at very low levels impairs behavioral development in young children. The FDA has set no action level for lead in seafood.

About half of our samples contained lead ranging from 0.31 to 7.8 parts per million. Compared with other foods, such as fruits and vegetables, which typically contain 0.01 parts per million, the lead levels in clams are high. ■

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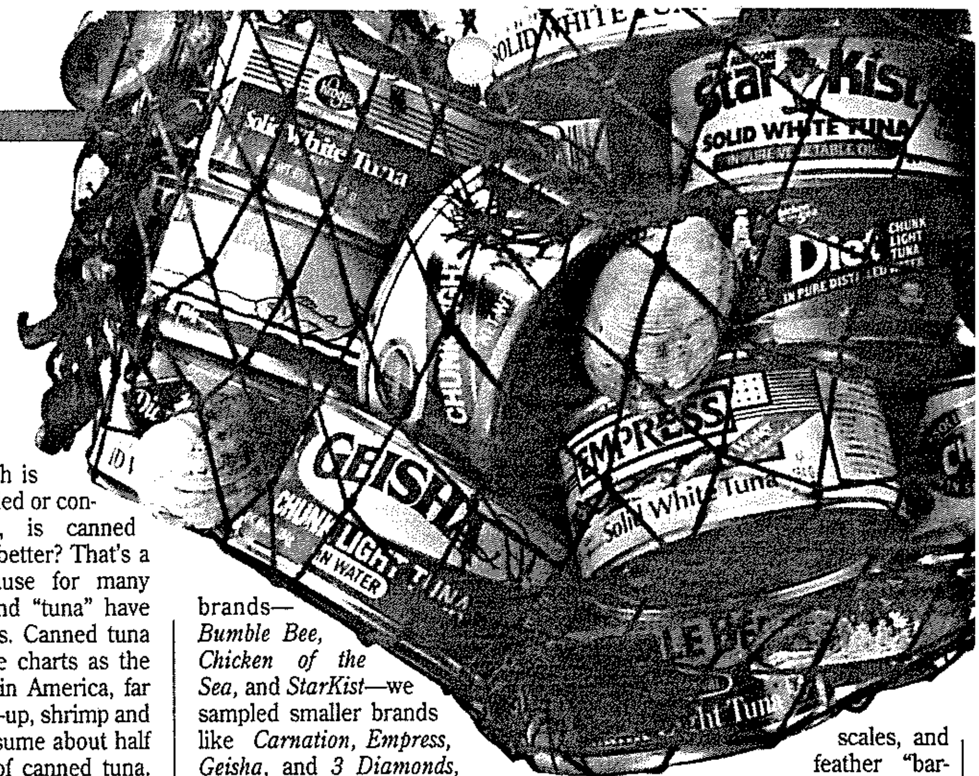
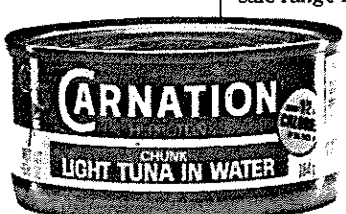
CANNED TUNA



It remains versatile, nutritious, and even cheap. But is it clean?

If fresh fish is often spoiled or contaminated, is canned tuna any better? That's a key question, because for many Americans, "fish" and "tuna" have become synonymous. Canned tuna consistently tops the charts as the most-eaten seafood in America, far ahead of the runners-up, shrimp and cod. Americans consume about half the world's output of canned tuna. They've been attracted, no doubt, by the product's low cost, convenience, and mild flavor.

The quality of canned tuna, however, has dropped in recent years. High bacterial counts are not a problem, as they are with the mishandled fresh fish we bought. Canning's high processing temperatures kill virtually all bacteria. And our tests show that levels of mercury, a potential hazard in swordfish, are generally within a safe range in tuna. But about half the samples we tested were contaminated with filth, primarily debris from insects, rodents, and birds—"extraneous matter" that the industry had virtually eliminated when we tested tuna in 1979. While this contamination does not pose a clear health hazard, it does suggest that overall sanitation in tuna canneries—most of which are now outside the U.S.— is not up to snuff.



High protein? **This tuna's "Hi-Protein" claim is redundant—all tuna is high in protein. Our tests found no more protein in Carnation than in the average chunk light, and about four grams *less* protein per serving than is listed on the can's label.**

For our tests, we netted cans of 41 tunas from around the country: solid and chunk, white and light, in oil and in water. (White tuna, the more expensive variety, is pure albacore, while light tuna is a mixture of different species of fish; see "Tuna Types," page 118.) We also bought three "diet"-type tunas—fish packed in water with no added salt—and one that claims 60 percent less salt than regular. In addition to the three big national tuna brands—*Bumble Bee, Chicken of the Sea,* and *StarKist*—we sampled smaller brands like *Carnation, Empress, Geisha,* and *3 Diamonds,* as well as several supermarket labels. Besides testing the fish for cleanliness, we evaluated our samples for appearance and taste.

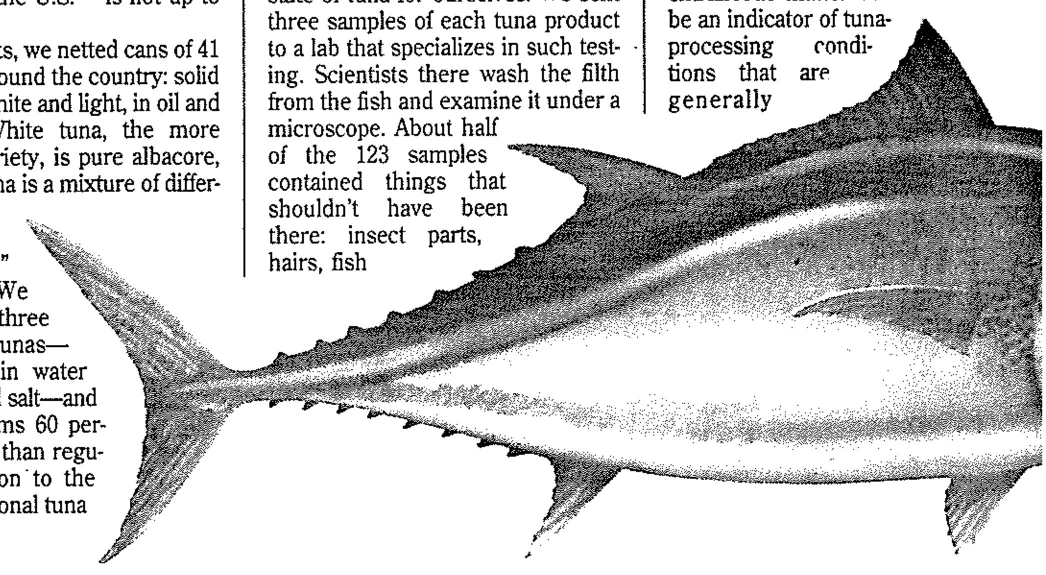
Contaminants in the can

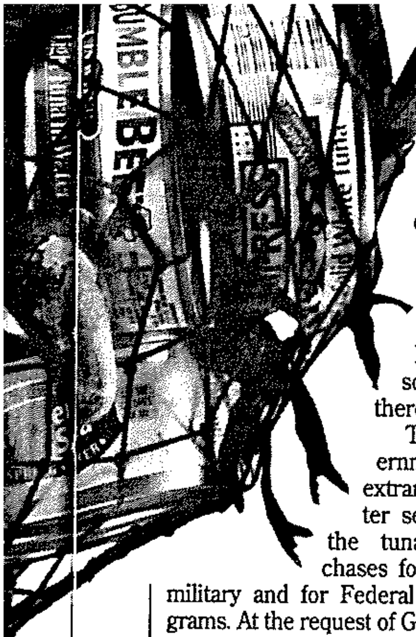
The U.S. Food and Drug Administration is authorized to ensure that processed food is free of extraneous matter such as rodent hairs and insect parts. Nevertheless, the Government considers a low level of such contaminants to be unavoidable because the filth originates in nature and it can't always be entirely removed. An FDA biologist told us that canned tuna is "relatively clean," citing a study published in 1988 that found extraneous matter in less than 5 percent of some 1600 cans examined. But when he checked the records at our request, he found that those tuna samples had been collected in 1977.

We decided to check the current state of tuna for ourselves. We sent three samples of each tuna product to a lab that specializes in such testing. Scientists there wash the filth from the fish and examine it under a microscope. About half of the 123 samples contained things that shouldn't have been there: insect parts, hairs, fish scales, and feather "barbules" (indigestible bits of feathers that birds swallow when preening and later excrete, apparently when flying around the boats and processing plants). Extraneous matter turned up in at least one sample of each brand we tested.

This wasn't the first time that our tests had found such contaminated tuna in cans. In 1974, we found a similarly high rate of filth in tuna. Following that report, the industry appeared to clean up its act; the next time we checked, in 1979, less than 2 percent of the cans we examined contained extraneous matter. So we know that it is possible for the industry to produce clean canned tuna. In the last several years, however, laxity seems to have set in once more.

Detritus from rats, birds, and insects won't necessarily make canned tuna unsafe to eat, since the canning process should kill bacteria the contaminants may carry. But this extraneous matter could be an indicator of tuna-processing conditions that are generally





unsanitary. In any case, contamination puts material in the food that has no reason to be there at all.

The Government takes extraneous matter seriously in the tuna it purchases for the U.S. military and for Federal food programs. At the request of Government agencies, the National Marine Fisheries Service, a part of the U.S. Department of Commerce, will test tuna before the Government buys it. The Fisheries Service will reject an entire lot of tuna if its labs find extraneous matter in even a small fraction of the cans of tuna they test.

If Uncle Sam demands a high level of cleanliness in the tuna it buys, then its consumer watchdog, the FDA, should do what's necessary to give the rest of us better than 50-50 odds of getting a clean can of fish. Better sanitation at the processing plants would keep out most of the insects and rodents, and would help wash off the feathers, insect parts, and hairs that still find their way onto fish. We urge the FDA to use its authority to inspect tuna for extraneous matter and to demand that canneries get out the filth.

Mercury: How great a risk?

Mercury, a toxic metal that can damage the brain and nervous system, is dispersed throughout the oceans. (The metal gets there from natural and industrial pollution of the atmosphere and rivers.) Background levels of mercury in the open ocean, where tuna live, tend to be extremely low, about 50 parts per *trillion* of water. Nonetheless, mercury can work its way from plankton up the food chain to concentrate in tuna flesh, just as it concentrates in other fish, like swordfish, that are likewise high on the food chain.

Swordfish typically have much higher mercury levels than tuna (see "What Chemicals Are in Fish?" page 112). But because Americans eat more tuna than any other fish, canned tuna is a greater source of exposure than other seafoods, and greater, for most of us, than any other item in the diet.

We sent three samples of each canned tuna out for testing to see how much mercury they contained. The FDA has set an acceptable limit on mercury in marine fish at 1 part per million (ppm) and, from health studies, has determined that a person's total daily intake should be no more than 30 micrograms of mercury (a little more than one-millionth of an ounce) from all sources.

Our findings are reassuring. The average level of mercury detected was 0.16 ppm, one-sixth of the Government's limit. If you eat half an average can of tuna, you'll consume just 15 micrograms of mercury, which is only half the acceptable daily maximum.

Our results represent averages. Six of the 123 cans we analyzed did have more mercury per serving than the 30-microgram intake limit—but an occasional dose that size is not enough, in our opinion, to worry about. We never found a product with high mercury levels in all three cans tested, and no brands, individual products, or types of tuna were consistently higher or lower in mercury than others. So even if you eat tuna regularly, your *average* mercury intake should be below the maximum safe level. And since mercury does its damage only over a long period of exposure, the average dose is what counts.

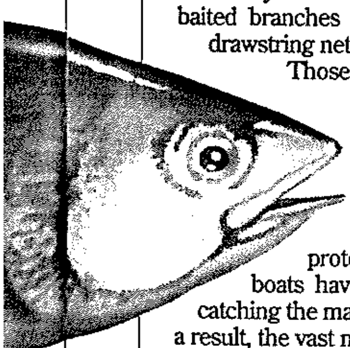
Based on advice from authorities on mercury toxicity, we believe the amount of mercury in the typical American diet—even a diet that

Incredible shrinking fish **In the 1970s, you could find 7-ounce tuna cans. Then packers switched to 6 1/2-ounce cans. Now they're 6 1/8 ounces. StarKist shrank its cans in 1990, and others soon followed suit.**

FROM CATCHING TO CANNING

HOW TUNA REACHES YOUR PLATE

Tuna, the biggest members of the mackerel family, are prodigious swimmers, plying the Atlantic and Pacific at top speeds of 45 miles per hour. Ancient Mediterranean fishermen posted watchmen on coastal cliffs to sound an alarm when a school swam by; the fishermen, waiting in boats below, took off in pursuit. Today, tuna are hunted by boats with "longlines" sprouting baited branches for miles, or with vast drawstring nets called "purse seines."



Those nets also used to trap and drown hundreds of thousands of dolphins a year. But in the wake of a tuna boycott in 1988 and a Federal law protecting dolphins, fishing boats have found ways to avoid catching the mammals in their nets. As a result, the vast majority of canned tunas sold in the U.S. are now "dolphin-safe."

Of the various tuna species, five typically wind up in cans. The albacore has white flesh and is often used for "solid" packing: It's canned in big sections cut against the meat's grain. By Federal law, albacore is the only tuna that may be labeled "white." It commands premium prices because of the fish's relative scarcity and the labor involved in catching it. (For albacore, fishermen must often use lines—sometimes bamboo poles—not nets.)

Four other species—yellowfin, bigeye, bluefin, and skipjack—are canned as "light" tuna, an inexpensive variety that often contains bits of two or more species. Light tuna is almost always canned in chunks—a mixture of pieces in various shapes and sizes—not solid cuts.

Tuna boats, out at sea for months at a time, usually freeze their catch in brine to transport it to the cannery. There, as one fisheries expert puts it, "they use every part of the fish but its smile." Some processors run their boilers on a fuel of tuna fat, and all routinely shunt fish scales, bones, and scraps into fertilizer and animal-food production.

The fish flesh that consumers ultimately buy is processed in stages. First, the fish are thawed, cleaned, and partly cooked. Only after that are the tuna boned and further trimmed of skin, scales, and various blemishes—all by hand—and sent to automatic equipment for shaping, cutting, and canning.

Processing most often adds salt, vegetable broth, and hydrolyzed protein, a flavor enhancer that can contain MSG. Sometimes vegetable oil is added, though most tuna nowadays is packed in water, a nod to dieters and others trying to cut down on fat. Finally, cans are vacuum sealed and heated to complete the cooking. In the end, a typical 20-pound fish will have yielded nine pounds of prime meat, enough to fill about two dozen cans.

includes a serving of tuna practically every day—poses virtually no risk to the average healthy adult. But one group needs to be prudent: pregnant women. We'd advise them to go easy on canned tuna, because fetuses are extremely sensitive even to very low doses of mercury.

Tuna nutrition

Despite this special concern for pregnant women, and the questions raised by the contamination we found, we consider canned tuna to be a safe food with much to recommend it nutritionally.

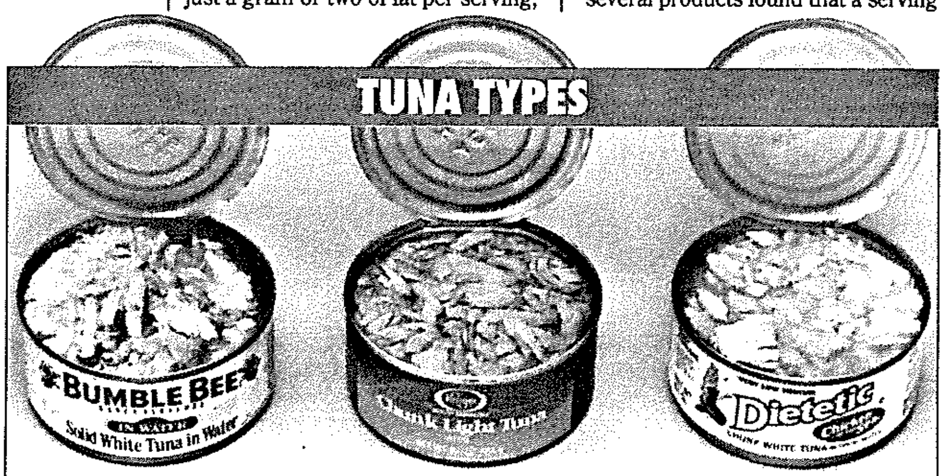
Tuna flesh is very rich in protein. Three ounces of solid white tuna in water—about half a can—supplies more than 20 grams of protein, roughly half a day's requirement for an adult. If the tuna is packed in water, that serving will contain only about 100 calories, roughly 85 percent of them from protein. (Chunk light tuna in water typically contains slightly less protein and fewer calories than solid white, because the space between chunks makes for a bit more liquid and less fish.)

When the processor adds vegetable oil, however, the calories and fat increase. Tuna in water supplies just a gram or two of fat per serving, roughly 10 to 15 calories' worth. By contrast, three ounces of chunk tuna in oil, drained, contains eight grams of fat, which account for nearly half of the serving's 155 calories. If you eat the oil-packed tuna undrained, you'll get 235 calories, close to 70 percent of them from fat. (See "Tuna Calorie Counts," page 120.) Draining an oil-packed tuna and then adding a tablespoon or more of mayonnaise per serving, as many people do, will make the fat and calorie count higher than it would be if it hadn't been drained at all. (A serving of any canned tuna also provides about 35 milligrams of cholesterol, roughly one-tenth a day's limit.)

Even without oil, tuna does contain some natural fat, but that fat may be beneficial. The fat of tuna, like that found in sardines and salmon, supplies omega-3 fatty acids, which research suggests may benefit the heart and circulatory system. White tuna is an especially rich source, supplying 650 milligrams per serving; light tuna offers only one-fourth as much. By comparison, fish-oil capsules typically supply only 300 to 500 milligrams of omega-3.

Tuna can contain a significant amount of sodium. Our spot check of several products found that a serving

TUNA TYPES



White tuna

- Must be albacore, a mild-tasting species with chicken-like flavor.
- Most samples tasted very good.
- Most are solid pack; a few brands offer chunk.
- Most expensive of canned tunas, often $1.50 per can.
- About 100 calories per serving if canned in water, 145 calories (drained) if in oil.

Light tuna

- Often a mix of yellowfin, skipjack, bigeye, and bluefin.
- Stronger fish taste than albacore. Most samples tasted good; none rated as very good.
- Virtually all are chunk.
- Most popular, cheapest variety, typically 75 cents a can or less.
- If packed in oil and eaten drained, slightly more calories than light.

'Diet' tuna

- Can be either a white or light tuna.
- Bland and dry—not too tasty in our tests—but looks attractive, with few blemishes.
- Spring or distilled water used in processing—no salt added.
- As expensive as solid white tunas.
- Except for sodium, nutritionally similar to regular tuna.

RATINGS

Canned tuna

Listed by types; within types, listed in order of overall sensory quality. Products that are within a few points of each other are similar in sensory quality; those with identical

Product
White tuna in oil
Bumble Bee Fancy
Chicken of the Sea Fancy
StarKist Fancy
3 Diamonds Fancy
White tuna in water
Bumble Bee
Lady Lee (Lucky Stores)
Empress Fancy
Chicken of the Sea Fancy
Bumble Bee Fancy
Kroger Fancy
StarKist Fancy
3 Diamonds Fancy
Carnation Fancy
Geisha
A&P Fancy
Albertsons
StarKist Select, 60% Less Salt
Chicken of the Sea Dietetic Fancy
Light tuna in oil
Kroger
3 Diamonds
Chicken of the Sea
A&P
Bumble Bee
Captain's Choice (Safeway)
StarKist
Light tuna in water
Captain's Choice (Safeway)
Chicken of the Sea
A&P
Lady Lee (Lucky Stores)
Carnation Hi-Protein
Geisha
Empress
StarKist
Pathmark
Albertsons
3 Diamonds
Bumble Bee
Kroger
Shop Rite
Chicken of the Sea Diet
StarKist Diet

1 *6½-oz. can.*

⊙ ◓ ○ ◒ ●

Better ⟵⟶ **Worse**

scores are listed alphabetically.

1 Pack. Solid pack (**S**) should contain one piece of fish cut crosswise. Chunk pack (**C**) contains smaller chunks and slightly more liquid.

2 Price. Unless noted, for a 6⅛-ounce can. Prices are the estimated average, based on prices paid nationally in recent months. A * denotes the price CU paid (if a national average wasn't available).

3 Sensory index. Based on measurements by our trained sensory panel. See text for "typical" profile of white and light tuna and our criteria for excellence.

4 Appearance. Unless otherwise noted, white tunas had a fairly uniform light color with a few blemishes and little grated fish; lights were darker and less neatly packed, with more grated fish

5 Sensory comments. Comments indicate distinctive characteristics of each product.

1 Pack	2 Price	3 Sensory index (0 Poor—Excellent 100: P, F, G, VG, E)	4 Appearance	5 Sensory comments
S	$1.57		◓	Uniform white color, mostly solid; mild, full flavor, chicken-like.
S	1.55		○	Mostly solid; a bit dry; chicken-like flavor.
S	1.54		◓	Uniform white, mostly solid (though much fish is grated in some cans); chicken-like flavor.
S	1.38		○	Mostly solid; a bit dry, tough; mild fish flavor, chicken-like taste. One can had rancid-oil taste.
C	1.28		○	Sloppily packed (many flakes, much grated fish); moist; full fish flavor.
S	1.21 [1]*		○	Blemished areas; some cans with much grated fish; full fish flavor with chicken-like flavor.
S	1.28		◓	Neatly packed; full fish flavor.
S	1.53		○	Light white but with blemished areas; some cans with much grated fish. Full flavor, chicken-like.
S	1.53		○	White color, neatly packed; but with blemished areas; some grated fish.
S	1.49		◓	Light white uniform color; mild fish flavor.
S	1.60		◓	Light white uniform color, relatively blemish-free; mild fish flavor, chicken-like; some cans with little saltiness.
S	1.42		○	Blemished areas; a bit sour, bitter, with tinny off-taste.
S	1.31		○	Beige; mild fish flavor; a bit sour, bitter, with tinny off-taste.
S	1.32		○	Neatly packed small chunks; a bit dry; mild flavor.
S	1.12		○	Neatly packed chunks; a bit dry; some cans with little saltiness.
S	1.33		◓	Neatly packed chunks; a bit dry; mild fish flavor; a bit sour, bitter, with tinny off-taste; some cans with little saltiness.
C	1.55		○	White; sloppily packed (many flakes); dry; bland, with sourness, little saltiness, and tinny off-taste.
C	1.63		◓	White; many flakes; dry, tough; very bland; a bit sour; not salty, with slight petroleum off-taste.
C	.58		○	Very light; sloppily packed (mostly flakes); relatively blemish-free; mushy texture; full flavor.
C	.78		○	Sloppily packed (mostly flakes); mild fish flavor.
C	.78		○	Dark beige; sloppily packed (but relatively blemish-free); full flavor, with sourness.
C	1.15		○	Sloppily packed (mostly flakes); slight organ-meat taste, sour, tinny off-taste.
C	.76		○	Some chunks, grated fish; mushy texture; sour, and slight bitter, tinny off-tastes.
C	.78		○	Sloppily packed (mostly flakes); relatively blemish-free; mushy texture; sour, salty, and slight bitter and tinny off-tastes.
C	.76		◒	Color varied; sloppily packed (most flakes); mushy texture; mild fish flavor; slight bitter and tinny off-tastes, plus iodine off-taste in some cans.
C	.72		◓	Neatly packed chunks.
C	.77		○	Sloppily packed (mostly flakes).
C	.73		◓	Relatively blemish-free.
C	.60		○	Sloppily packed (mostly flakes). Some cans with little saltiness.
C	.83		◒	Sloppily packed (mostly flakes); some cans with much grated fish, blemishes; salty, with tinny off-taste.
C	.71		○	Dark beige; more chunks; relatively blemish-free; tinny off-taste.
C	.66		◓	Dark beige; more chunks; relatively blemish-free; sour taste.
C	.77		◒	Sloppily packed (many flakes); many cans with excessive grated fish; sour taste.
C	.79 [1]		◒	Sloppily packed (mostly flakes); bitter, some cans with iodine off-taste.
C	.56		○	Pink; sloppily packed—some cans with much grated fish—but relatively blemish-free; excessively fishy taste.
C	.79		◒	Dark beige; sloppily packed (mostly flakes); some cans with much grated fish, some fat globules; organ-meat taste, bitter, with tinny off-taste.
C	.80		○	Dark beige; sloppily packed; slight organ-meat taste.
C	.54		○	Dark beige; more chunks; salty and bitter, with tinny off-taste.
C	.59 [1]*		◓	Relatively blemish-free; slight organ-meat taste.
C	1.35		◓	Light color; more chunks; relatively blemish-free; dry; very bland; a bit chicken-like flavor; not salty.
C	1.39		◓	Light color; more chunks; dry; very bland; a bit chicken-like, not salty, less sour and bitter.

of regular canned tuna supplies anywhere from 160 to 375 milligrams of sodium, with considerable variation from can to can of the same product. People who must follow a sodium-restricted diet may want to try a special low-sodium brand. The no-salt-added "diet" tunas we checked supply only about 30 milligrams of sodium per serving; the reduced-salt *StarKist Select,* about 80. But rinsing a serving of regular tuna will also generally remove most of the sodium, although you'll lose some B-vitamins as well.

Is that tuna 'excellent'?

If you eat your tuna in a casserole or mixed in a salad with mayonnaise, celery, and onions, you may not care much what it tastes like plain. But for dieters and others who eat tuna unadorned, we had a trained taste panel sample the fish straight (after draining) for flavor and texture. The results form the basis of the Ratings' sensory index.

Our standards for taste were different for white tuna—the more expensive, pure-albacore variety—than for light tuna, a mixture of different types of the fish. To be rated excellent, a white tuna must have a mild to moderate fish taste, often with a slight chicken-like flavor, while excellent light-meat tuna can have a stronger fish flavor. Both kinds should be moderately salty but free of off-tastes like tinny, iodine, petroleum, or organ-meat flavors. In addition, both should be slightly firm, moist, and easy to chew.

We also had the panel evaluate the fish for appearance after samples of fish were drained. The best white tuna should be white in color, sometimes tinged with pink; light tuna may be beige, but not too dark or discolored. The panel checked for sloppy packing and blemishes such as blood spots, yellow patches, bones, bits of skin, and scales. The Ratings include a score for each tuna's appearance separate from the sensory index.

In taste tests, the white tunas generally swam far in front of the competition. While none was scored excellent by our standards, many came close and were scored as very good. White tunas in oil tended to rack up the highest scores of all, probably because fat helps to round out and enhance the flavor and makes the tuna less dry. *Bumble Bee* topped the list, with the two other major brands, *Chicken of the Sea* and *StarKist,* close behind. There were also very good white tunas packed in water. *Bumble Bee* led again, followed closely by *Lady Lee, Empress,* and *Chicken of the Sea.*

As a group, the light tunas—whether in oil or water—scored at least a notch below the whites. None was judged better than good on our sensory index. The light-meat tunas generally had an "unclean" flavor: Most had at least a slight sour, bitter, or metallic taste. They generally weren't much to look at, either; the cans contained some grated fish and were sloppily packed. Two supermarket brands topped the lights: *Kroger,* packed in oil, and Safeway's *Captain's Choice,* in water.

The low-salt tuna and the three diet tunas—two white, two light—were rated lowest of all in taste within their types. Blandness and dryness were the main reasons.

Because tuna is a natural product, we expected a certain amount of variation from can to can. We found a bit, so the sensory index is necessarily a composite score for each tuna. We further learned that you cannot generalize about the big three brands. *Bumble Bee* and *StarKist,* each capable of canning such a good white tuna, turned out mediocre-tasting light tunas. Results for *Chicken of the Sea* were also mixed.

Recommendations

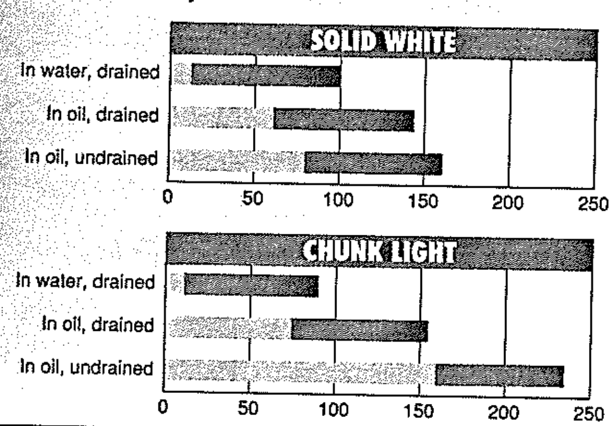
Canned tuna is an excellent, low-cost source of protein. Depending on how it's canned and served, it can also carry a significant amount of fat. If you're concerned about your fat intake, you'll get much less fat and fewer calories from water-packed tuna than from tuna packed in oil. However, there are no major nutritional differences between light and white tuna, or between solid and chunk, if you drain the can. The expensive "diet" tunas, too, offer no nutritional advantage over other water-packed tunas besides their low sodium content—and you could lower sodium just as well by buying any water-packed tuna and rinsing it.

The taste differences between white and light tuna may not be worth the extra cost of white, unless you take your tuna straight or lightly dressed. While white tunas generally scored higher in our taste tests, adding lots of mayonnaise, onions, and spices would likely overwhelm the flavor differences we noted. So if you mix your tuna into tuna salad or bake it in a tuna-noodle casserole, save some money and buy light, not white. Light tuna is often half the price of white or less. Even so, the sour, bitter, and "unclean" taste of many light tunas means you might well want to look for products near the top of the Ratings.

For tuna connoisseurs, *Bumble Bee Fancy Albacore,* a solid white tuna in oil, tasted best in its class and contained nary a blemish. For those avoiding fat, *Bumble Bee Albacore,* a chunk white tuna in water, also tasted very good, as did *Lady Lee* and *Empress* brands, both solid white tunas in water. ■

TUNA CALORIE COUNTS

Here's how the different varieties of tuna measure up. The gray area of each bar represents the number of calories that come from fat. Values are rounded calorie counts for a three-ounce serving (about half a can). Data are for Chicken of the Sea, but other brands are similar. A tablespoon of mayonnaise adds about 100 calories, virtually all fat.



Uncle Sam should pay to clean Pago harbor's pollution

American Samoa Congressman Faleomavaega Eni believes that the U.S. government is to be blamed for the pollution of Pago Pago Harbor and he wants to see the United States foot the bill to clean it up.

In an interview with a Television New Zealand crew at his local office last week, the congressman said, "Uncle Sam has been the primary player and (is) the reason we now have this very serious problem in the bay." He was commenting on the high levels of toxins detected in fish caught in the inner Pago Pago Harbor area, which recently led the government to issue a health advisory not to eat fish caught there.

The territory's non-voting delegate sees the poisoning of Pago Pago Harbor as a federal issue because as he put it, "it involved the federal government and I expect that they would have to give us some assistance and see that we resolve it."

Faleomavaega referred to the sinking in 1949 of a naval oil tanker in the area of the main dock and said that if the freighter keeps falling into deeper waters, it will be a virtually impossible effort to retrieve it. Divers have told *Samoa News* that they have sighted the beams of the tanker 150-200 feet down in waters adjacent to the main dock.

[redacted] was scuttled and sank after naval authorities could not put out an on-board fire which began while the tanker was discharging its cargo. Naval records at the American Samoa Archives Office show that the boat went down with a full fuel load, 3,000 rounds of 3 inch ammunition and 16,000 rounds of 20 mm ammunition. The October 7, 1949 accident claimed six lives. The U.S. Navy never made an effort to salvage the tanker or its cargo.

Congressman Faleomavaega commented, "the question is not whether or not there is heavy metal in the bay. The question is are we going to clean it up and how much the cost is. And I'm told it will cost us an arm and a leg."

Faleomavaega has already written to the chief administrator of the U.S. Environmental Protection Agency asking for a determination on the cost and method of correcting the pollution in inner Pago Pago Harbor.

American Samoa's man in Washington also expressed grave concern of the health hazards resulting from eating poisonous fish, especially among children. He said, "...if any of these children end up dead because of the toxic poison contained in the water because they eat the fish, I don't think any amount of money is going to compensate for the loss of human lives..."

Saying that it's best to err on the side of caution, Faleoamavega said that he has not heard of any casualties yet, "but I would rather (we) overreact now, than not do anything and discover it was a hundred times worse later."

An EPA review of the draft report of the toxicity study on Pago Pago Harbor showed that lead levels in the water, fish and sediments was a matter of concern and recommended blood testing to determine just how serious the problem was. Local agencies involved in the study say they have made contact with the Centers for Disease Control in Atlanta and the World Health Organization for assistance in launching such a blood testing effort. Details have not been announced.

MONDAY, NOVEMBER 4, 1991

OCT-28-1991 08:36 FROM SK ENG SVC 213-590-3882 TO 914157441604 P.01

OCT-25-1991 12:31 FROM ST KIST SAMOA TO ENGINEERING

CONGRESSMAN ENI SAMOA TEL No.684-633-2680 Oct 25,91 12:23 No.002 P.02

NEWS RELEASE

CONGRESSMAN

ENI F. H. FALEOMAVAEGA

TERRITORY OF AMERICAN SAMOA

U.S. HOUSE OF REPRESENTATIVES

413 Cannon Office Building Washington, D.C. 20515 (202) 225-8577

October 23, 1991

FOR IMMEDIATE RELEASE

WASHINGTON, D.C. ----- FALEOMAVAEGA ASKS EPA FOR IMMEDIATE ASSISTANCE ASSESSING THE COST IN CLEANING UP PAGO PAGO HARBOR

In support of the health advisory issued by the American Samoa Government regarding the levels of contaminants in the inner Pago Pago harbor, Congressman Faleomavaga has asked William K. Railly, Administrator of the U.S. Environmental Protection Agency, for assistance in determining the best method of improving the quality of the water in the harbor and the cost to clean it up.

The Congressman is particularly concerned with the health of the children who may have eaten contaminated fish from the harbor, and urges all parents to cooperate with any studies the federal or local government may conduct to determine the amount of contaminants which may have been transferred to children and older people eating harbor fish.

"The level of contaminants in the harbor is of tremendous concern to me and I will do all I can to help find funding for an assessment and clean up of these terribly polluted waters," said Faleomavaega.

Cong. Faleomavaega
October 23, 1991
Page 2

"I want to emphasize again the importance of eating no more fish caught in the inner harbor until a more accurate determination can be made as to the serious of the hazard," concluded Faleomavaega.

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Faleomavaega asks U.S. Environmental agency for Pago Harbor help

Congressman Faleomavaega has asked William K. Reilly, Administrator of the U.S. Environmental Protection Agency, for immediate immediate assistance in determining the best method of improving the quality of the water in Pago Pago Harbor and the cost to clean it up.

In a press release issued yesterday, the congressman expressed his support for the health advisory issued by ASG last week which warns residents of the danger of eating fish from the inner harbor because of the high levels of contaminants present.

The release stated that Faleomavaega is particularly concerned with the health of the children who may have eaten contaminated fish from the harbor, and urges all parents to cooperate with any studies the federal or local government may conduct to determine the amount of contaminants which may have been transferred to children and older people eating harbor fish.

"The level of contaminants in the harbor is of tremendous concern to me and I will do all I can to help find funding for an assessment and clean up of these terribly polluted water," said Faleomavaega.

"I want to emphasize again the importance of eating no more fish caught in the inner harbor until a more accurate determination can be made as to the serious of the hazard," concluded Faleomavaega.

When contacted Tuesday by the *Samoa News* for the views of the governor, the governor's press officer, David Freibert, said that the territory's children are the governor's first priority. Freibert promised to provide a more specific comment later, but none have been received to date.

(The governor and his press aide were in Manu'a yesterday, but the *Samoa News* was unable to learn for what purpose.)

The health advisory was issued by the American Samoa Environmental Protection Agency, which is a division of the Office of the Governor, and the Department of Marine and Wildlife Resources.

10/24/91

"Old fish tales" told again

The disclosure that years of industrial and military activity may be responsible for the high levels of poisonous substance found in the inner harbor has rekindled memories of environmental abuse during the era when the territory was a naval coaling station.

Since the government's warning that fish caught in the area between Leloaloa and the Rainmaker Hotel can be deadly, *Samoa News* has received vivid accounts from long-time residents of oil spills, ammunition shells spilling into the sea and matais dying after eating poisoned seafood, during the naval days.

HTC Tuaolo Lemoe, whose avocation is local history, believes that the U.S. Navy can be rightfully blamed for having a major role in poisoning local waters. The Pago Pago matai pointed to several examples of environmental abuse during the naval era.

OIL TANKER GOES DOWN

One incident that stands out in his memory was the sinking of the oil tanker *U.S.S. Chehalis* in 1949. "The tanker was refueling and a fire started. There was an explosion and two crew members died," he recounted. "They couldn't contain the fire so they pumped water into the vessel. It went down with a full load of fuel and as far as I know it's still down there in the middle of the harbor." Tuaolo said that the Navy has not made any attempt to retrieve the sunken vessel or pump up its fuel load.

Records from a naval court of inquiry into the incident, stored at the American Samoa Archives Office in Fagatogo, provide a more detailed account of the October 7, 1949 accident. According to the

(Continued on page 10)

FISH

from previous page

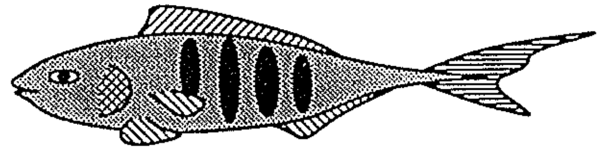
warning only came out last week after a series of meetings among the ASG agencies involved in the toxicity study were held to decide what to do about the USEPA suggestions.

WHAT'S HAPPENING NOW

Environmental Co-ordinator at the local EPA Office Sheila Weigman says contact has been made with the Centers for Disease Control and the World Health Organization for funding assistance and guidance in administering the blood tests.

A public awareness campaign educating the public about the toxicity study and warning them of the dangers of eating poisoned fish is already underway. Leaflets are being distributed to Bay Area residents, notices are appearing on the newspapers and aired on television and radio and meetings at the village level are being co-ordinated. Warning signs will also be posted in popular Bay Area fishing spots.

Marine Biologist at the Department of Marine and Wildlife Resources Peter Craig explained that no-one can be stopped from fishing in the inner harbor--they are free to make that choice. However, Craig said it is important that fishermen and residents be made aware of the consequences of their actions. If they decide to feed the contaminated fish to their families, they cannot be stopped from doing that either. However, if they decide to sell their catches then that's a different story and they may find themselves up against the law.



Samoa Daily News 10/15/91

Public is warned not to eat fish caught in inner Pago Pago Bay

Fish caught in the inner portion of Pago Pago Harbor (anywhere towards Pago Pago from a line drawn between the Rainmaker Hotel and Leloaloa) should not be eaten because it may be poisonous as a result of existing serious contamination problems in Pago Harbor, according to the American Samoa Government, which issued a health warning Friday.

The warning is based on a recent government study of [illegible] study was limited to the inner harbor, it seems probable that contamination levels are lower in the outer harbor where there is more water exchange with clean offshore waters. Further studies are needed to verify this.

The advisory says that fishing may continue in the outer harbor, but fish caught there should be gutted and cleaned before eating--do not eat whole fish taken anywhere in the harbor.

(While toxic chemicals are found throughout the fish's body, this fish's liver is [illegible] This includes small fish as well as large fish.)

The advisory urges everyone to reduce or eliminate the amount of harbor fish consumed, particularly by children who are at the greatest health risk.

The Department of Marine and Wildlife Resources (DMWR), American Samoa Environmental Protection Agency (ASEPA), and the American Samoa Coastal Management Program (ASCMP) completed the study. Findings of the pilot [illegible]

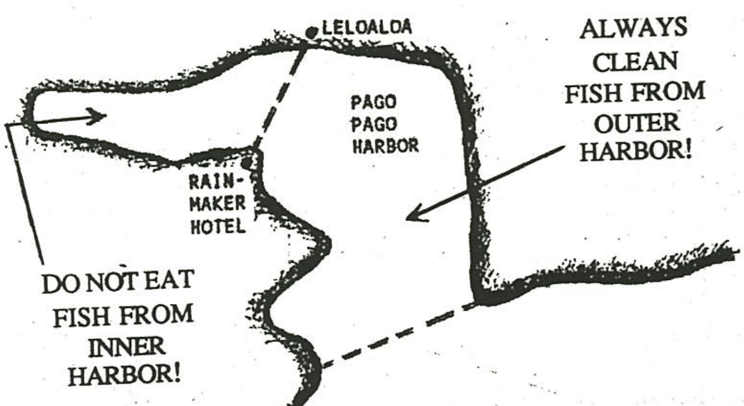
Risk assessment calculations by the U.S. Environmental Protection Agency (USEPA) show that the high levels of metals in fish tissue from the inner harbor may cause adverse health effects. Modeling completed by the USEPA revealed that the concentration of lead alone may reach levels that cause a permanent reduction in the intelligence of children who regularly consume 3-4 meals of harbor fish per week. Based on USEPA recommendations, a testing program for blood lead level is being designed.

Sources of toxic pollutants found in this study are most likely due to the accumulation of contaminants from industrial, natural, and military uses over the past century. Existing discharges to Pago Pago Harbor are not necessarily contributing to the problem. Cannery discharges are primarily nutrients and show no toxic nor high metal concentrations.

ASG will pursue further toxicity testing of Pago Pago Harbor; until these studies are complete, it is recommended that the health advisory be followed.

Fish from other locations around Tutuila island are considered safe for consumption.

For more information, contact: American Samoa Environmental Protection Agency (633-2304), Public Health Division (633-4623), Coastal Zone Management Program (633-5155), or Marine and Wildlife Resources (633-4456).



FAA grounds Samoa Air's Twin Otters

Samoa Air's two Twin Otter airplanes were grounded Friday by the Federal Aviation Authority (FAA) for failure to comply with a new FAA regulation which requires the airline to equip its planes with a cockpit voice recorder. (The CVR records what the two pilots say to each other; the recorded tapes are used by the FAA to determine the cause of aviation accidents.)

As a result, there has been no air service linking the Manu'a islands with Tutuila since Friday afternoon. Samoa Air President Jim Porter hopes that the airline will get some temporary relief from the regulations today, and will begin flying to Manu'a immediately if the FAA grants the temporary extention the airline is seeking.

On Friday afternoon, the FAA's Honolulu office notified Samoa Air that it was declining the locally-owned airline's request for a 90-day extension to allow the inter-island carrier to install CVRs which are being obtained from the mainland. It was too late to appeal the decision to Washington, D.C.

As a result of the last minute denial of the extension request, Samoa Air's two Twin Otter light aircraft were

(Continued on page 4)

Samoa Daily News 10/15/91 PAGO PAGO, AMERICAN SAMOA TU

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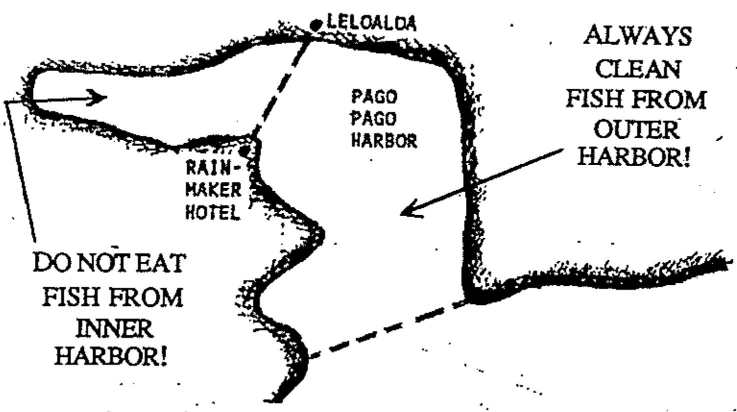

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(Continued on page 4)

Secretary of Interior Manuel Lujan that moves the National Park of American Samoa one step closer to establishment.

The letter of intent informs the Secretary that the Governor is prepared to sign a 50 year lease to create the nation's 50th National Park in American Samoa, provided that two key steps are completed first.

The Governor has required that a full land appraisal be done, and a lease price for the 8,000 acres designated for the park be agreed upon before proceeding. Following the appraisal, the Governor and to reach agreement on their common village boundaries.

To expedite the boundary agreement process, PC Lualemaga Faoa, the Governor's special assistant for the park project, will call a meeting of the principal matai of the villages with land in the proposed park.

The meeting will be held at the new Executive Office Building in Utulei and the date and exact time of the meeting will be announced soon.

For any further information, please address questions to PC Lualemaga at 633-4116.

Fires out-of-control in four Western states

SPOKANE, Wash. (AP) — Evacuees began returning to their burned-out homes as gusting wind eased Thursday, helping firefighters battle wildfires that have destroyed more than 100 homes and killed five people across four states.

"Before the fire was letting us fight it on its terms, but now the tide has changed a little bit," U.S. Forest Service spokesman Kevin Kennedy said in Oregon. "This is a real big day for us."

Fires across parts of Washington, Idaho, Montana and Oregon scorched hundreds of thousands of acres of grass, brush and timber. Most were ignited Wednesday by power lines downed in a fierce wind storm that gusted to more than 60 mph and kicked up heavy dust.

Killed were an eastern Washington woman trying to flee her home, two people crushed by heavy equipment in Idaho and Montana and the pilot and co-pilot aboard a California-based air tanker that crashed en route to firefighting duty in Montana. The wreckage was found Thursday.

AMERICAN SAMOA GOVERNMENT

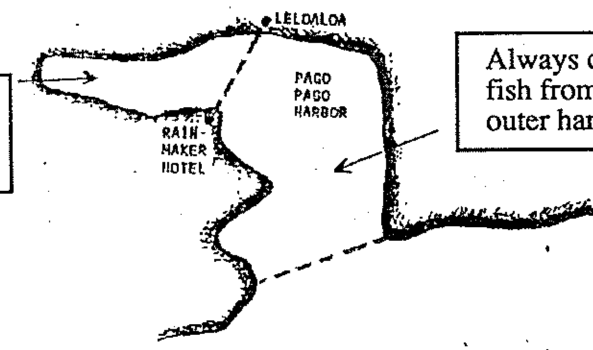
PUBLIC NOTICE

IMPORTANT HEALTH ADVISORY FOR PAGO PAGO HARBOR

CONTAMINATED FISH IN HARBOR

Due to serious contamination problems in Pago Pago Harbor, we advise all people not to eat any fish caught in the inner harbor (see figure below). Fishing may continue in the outer harbor, but fish caught there should be gutted and cleaned before eating -- do not eat whole fish taken anywhere in the harbor. Reduce or eliminate the amount of harbor fish consumed, particularly by children (who are at the greatest health risk).

Do not eat fish from inner harbor.



Always clean fish from outer harbor.

EXPLANATION: A study has shown that fish caught in the inner harbor are seriously contaminated with lead, other heavy metals, and other contaminants. A health risk analysis conducted by EPA indicates that the concentration of lead alone may reach levels that cause a permanent reduction in the intelligence of children who regularly consume 3-4 meals of harbor fish per week.

While these toxic chemicals are found throughout the fish's body, the fish's liver is particularly poisonous. Therefore, all fish taken anywhere in the harbor should be gutted and cleaned before eating. This includes small fish as well as large fish.

Although sampling for this study was limited to the inner harbor, it seems probable that contamination levels are lower in the outer harbor where there is more water exchange with clean offshore waters. Further studies are needed to verify this.

ISSUING AGENCIES: For more information, contact: American Samoa Environmental Protection Agency (633-2304), Public Health Division (633-4623), Coastal Management Program (633-5155), or Marine and Wildlife Resources (633-4456).

Samoa News 10/18/91

God made the fish ... it's still safe to eat, protests local fisherman

"God made the fish... it's still safe to eat." That's the explanation given by an elderly subsistence fisherman when asked why he was still fishing in Pago Pago Harbor. He said that he knew about the government advisory telling people not to eat fish caught in the inner harbor, but he did not take notice of it because he had been fishing most of his life in the area and none of his family ever got sick from eating his catch.

At the Star Kist dock on a wet Wednesday morning, six fishermen in two aluminum skiffs are reeling in their lines. One shows off his prized catch for the morning, a three pound "jack" *(tafala)*. Perched on the deck of purse seiners and Oriental longliners alongside the cannery dock, about eight other young fishermen are waiting to feel a pull at the end of their lines.

"Have you read the notice that fish caught in the harbor is not safe for eating?" I ask the oldest of the fishermen, a stocky built man, about 50 years old. He's cutting up what looked like an *aku* and throwing the pieces into the dark green, colored water. "Yes, I've read the notices," replies the fisherman."

"Then why are you still fishing here?" I asked in response. He stated that no-one in his family has been sick from eating the fish. In the second boat, the fisherman who landed the two silver jacks calls out that they don't sell their catch, that they only feed their families with the fish they haul in (this is what is known as "subsistence"). A bunch of *misiluki* bananas and a cooler sit between the two fishermen in this second skiff.

After some urging, one of the younger fishermen on board replies that he's read the health advisory telling people that fish caught in the inner harbor is not safe to eat, but he's not taking any notice of it. He assures that he doesn't sell his catch and that none of his children have fallen ill from eating the fish he puts on the table.

I try to explain that tests have shown that fish caught in the area between the Rainmaker Hotel and Leloaloa contain poisonous (toxic) substances which can make them sick, maybe not now but in the future. I ask them why they don't try fishing somewhere else and I just get a blank look. "If you love your kids, don't feed them that fish," I call out. Before our alia takes off, one of the fishermen assures that they'll think carefully about the health warning.

What we had stumbled on was an everyday happening which has continued unimpeded in spite of the recent warnings not to eat fish in the harbor... a practice which, from all indications, will take many years and a major public education effort, to stop.

(It is not illegal to fish in the inner harbor, nor to eat the fish caught there. As explained below, the government has informed commercial establishments, such as bush stores, that it is a violation of law to sell fish from the inner harbor.)

How do you tell someone who has depended on the sea for food that they can no longer fish in a certain usual area because the water is so full of poisons that the fish have also turned bad?

The fish still look okay, they're not dead so they must be safe to eat, traditional fishermen reason. How are they to know about the delayed effects of the invisible lead, oil, PCB and other toxins in the waters they've fished in for years?

The fishermen in the skiffs we saw that morning were probably part of a growing fleet of small scale commercial fishermen. Before the fish advisory was issued, the fleet was selling their catches to bush stores and restaurants around the island, with the bulk going to Bay Area establishments. Since the warning

(Continued on page 9)

11/1/91

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Governor Coleman addresses Pago Pago Harbor health alert

(The following is a press release from the Office of the Governor.)

The Governor's Office yesterday announced that it is working with the EPA, the Department of Marine and Wildlife Resources and other agencies on a number of projects designed to address the harbor health alert announced recently.

"Our first priority is protect the health of all American Samoans -- especially our children," Governor Coleman said. "To accomplish that, several programs to inform the public of the risks and to determine the level of risk are already underway."

"Secondly, we must continue and intensify our efforts to address the root causes of that problem," Governor Coleman said. "The studies indicate that the problems we are now discovering have their roots back decades ago. Many of the contaminants and toxins that have been identified are found in DDT and other chemicals which haven't been used in years, but remain embedded in the harbor's sediment."

Projects currently underway to address potential health problems, as well as address the long-term condition of the harbor include:

1. The creation and implementation of a large-scale public information strategy;
2. Determination of the magnitude to the problems, in terms of eating patterns, level of contaminants in the blood stream of residents and the overall risk;
3. The identification of funding sources for the testing programs;
4. Implementation of tional research and studies of the harbor environment, including comparison with other, similar environments;
5. The identification of funding for the research; and,
6. Continued and intensified harbor clean-up efforts.

In the effort to fully inform the public of the potential

Continues Next Page

health hazards, the initial health bulletin has already been released and a multifaceted public information strategy will soon be employed. Included in that information effort will be additional bulletins released to the media, village and school presentations on the hazards, group presentations, and other means of information sharing.

In order to determine the most effective means to test blood levels for contamination, the EPA has been in contact with the Centers for Disease Control (CC) in Atlanta and the World Health Organization (WHO) to discuss the availability and applicability of different blood level tests.

In addition, the Department of Marine and Wildlife Resources has already begun a fish consumption survey to help determine the number of people at risk.

The CC and the WHO are also potential funding sources for the application of the testing program.

Extensive additional research on the harbor and health hazards is planned, and the EPA is currently developing the outline of that research program, as well as identifying potential sources o

Potential sources for continued research and clean-up efforts include the U.S. EPA the National Oceanographic and Aerospace Administration and the Department of Interior

Faleomavaega calls for environmental study

Congressman Faleomavaega last week urged NATO member countries which possess nuclear weapons to examine the environmental impact of nuclear testing. In an amendment to a draft resolution on nuclear arms control, Faleomavaega introduced an amendment "to establish a scientific commission within the Atlantic Alliance to examine the environmental impact of nuclear testing--in particular, nuclear contamination in the atmosphere, above and underground, and on or underwater."

The resolution was unanimously accepted and passed during the plenary session of the of the thirty-seventh annual Conference of the North Atlantic Assembly held last week in Madrid, Spain. According to the congressman, even the parliamentary delegation from France voted in favor of the amendment.

Faleomavaega along with sixteen other Members of Congress represented the United States Congress at the conference. The conference was composed of some 300 parliamentarians from the various European countries that make up the North Atlantic Treaty Organization.

Faleomavaega noted, "This is a beginning, at least, and I believe is in compliance with basic U.S. policy towards nuclear testing. I am hopeful that the French Government will cooperate in the establishment of the scientific commission to measure the extent of nuclear contamination in the various sites or areas where nuclear detonations are taking place."

Faleomavaega was also appointed by the U.S. delegation to work in a special task force that will examine the problems of the environmental problems associated with the Arctic Zone, particularly the alarming depletion of the earth's ozone layer.

Dr. Solomona went off island and earned a doctorate in education. He returned home and for the past 16 years has served in the Department of Education with distinction. He is doing the work for which he prepared himself.

He is obviously a qualified educator and the ASG personnel system has worked for him, and for the entire territory.

But just as there is a specialized body of knowledge associated with the field of education, so is there such a specialized body of knowledge associated with the fields of economic development and planning. Being the director of economic development and planning for a small, isolated, relatively impoverished tropical island requires more than common sense and intuition.

(Continued next column)

samoa news, *Friday, October 25, 1991*

from previous column

That is, it requires more than common sense and intuition if the tropical island is going to grow and accommodate that growth in a way that raises the quality of life and standard of living of its residents.

In announcing Solomona's nomination, Governor Coleman said the nominee was "obviously qualified." But those qualifications are not obvious. There was no mention or indication in the governor's press release that Solomona has ever been involved in the areas in which DPO works: e.g., economic development and planning, national accounting, statistics and analysis, land-use planning, natural resource management, environmental protection, social planning, infrastructure planning, or administration of a regulatory regime.

The Economic Development and Planning Office needs a director with some background and experience in at least some of these fields if the office is going to make a significant positive contribution to the quality of life and standard of living of the territory.

It is of course possible that someone with a different background can meet success at DPO, but that possibility should not be pursued as long as qualified candidates are available, and/or if the need for success is great (it is--just ask each year's 1000 school-leavers who cannot find work here in American Samoa).

samoa news, *Wednesday, October 23, 1991*

Governor Coleman nominates Solomona for DPO directorship

Governor Coleman has made official his intention to nominate Meki Tavita Solomona to serve as Director of the Development Planning Office. Solomona, currently Deputy Director of Education for Public Affairs, Personnel and Liaison Services, will assume the top position with DPO on Monday, October 28 in anticipation of confirmation by the Fono when the legislature reconvene in January.

Governor Coleman cited Solomona's "obvious qualifications and his outstanding record of more than 16 years of service to the people of American Samoa," in announcing his choice.

Solomona has worked at the Department of Education since returning to the island in 1976 with his Doctor of Education degree from Brigham Young University.

DPO Deputy Director John Faumuina, Jr. has been serving as Acting Director since Lydia Faleafine left the position two months ago to become the Interior Department's local Field Representative.

According to a press release from the Governor's Office,

with the fine DPO staff to do everything we can to make the Development Planning Office most effectively service the needs of the people of American Samoa."

(Solomona unsuccessfully challenged DPO in administrative and judicial court proceedings earlier this year after his application for a land use permit was denied by the PNRS permit process administered by DPO. Solomona was seeking a permit to build a house on submerged lands he had filled at the Leone pala without obtaining a permit, as required. The local appellate court upheld the permit denial and the permit has never been issued. Further legal action by the government is pending while DPO and ASG prepare a Wetlands Management Plan, which will be ready for review and adoption later this year.)

In commenting on his nomination, Solomona said, "I would also like to say that I owe this honor to my mother Rosa and late father Si'ulasi, who have been my inspiration. They put all six children through college and instilled in us a belief that education and

Solomona also thanked Judge Mere Betham for her influence and assistance in his higher education and public service.

Solomona was born in Leone in 1954 and attended local schools until moving to California, where he attended high school and the University of California, Riverside.

Upon his return to American Samoa after receiving his advanced degrees, Solomona became a Social Studies teacher at Samoana High School in 1976. He became Vice Principal in 1978 and served as Principal for 1980 to 1984.

In 1984, Solomona moved into the central offices at the Department of Education, where he was involved in administration of federal grants. From 1986 to 1989, he served as Special Assistant to the Director and has been Deputy Director of Education for Public Affairs, Personnel and Liaison Services since 1990.

Solomona is married to the former Vaofu'a Soliai and they have a daughter, Katerina.

Meki is active in the community and often serves as an announcer or commentator on the radio and television for sporting and cultural events. He actively participates in local political campaigns and most recently was a key member of the campaign committee seeking to elect Ace Tago to the U.S. House of Representatives.

Fruean: first to find poisoned Pago fish

Meet Kolose Fruean, the science student who is credited for initiating the toxicity study of Pago Pago Harbor, which has produced frightening information about the amount of poisons in a popular fishing ground.

It all began in 1987 when the would-be scientist was contemplating an idea for a science project for his high school Science Fair. It was by chance that he was watching a NOVA television documentary which focused on toxicity problems in a stateside harbor, created by heavy industrial activity. He said the scenario was very similar to Pago Pago Harbor. He decided to take up the project and got support from science specialist Paul Cassens.

The Samoana student collected samples of sediment, seawater and fish from the inner harbor area, specifically, the marine railway, American Samoa Power Authority and the mouth of Vaipito Stream and compared them with the same samples taken from Fagasa Bay.

With guidance from his science teachers and the Department of Marine and Wildlife Resources, the young researcher wrote to the federal Environmental Protection Agency for information on how to conduct the tests. He was looking specifically for lead and mercury in the collected specimens.

The project became a two year hobby for the young student. He told of dissecting fish caught in the harbor area to find black spots on the fish's liver. And he said the smell of oil from his harbor specimens was overwhelming. Fish caught from Fagasa on the other hand did not show signs of bad coloring and did not have any smell.

In a paper he compiled on his research project, Kolose wrote that through qualitative analysis, he found evidence of mercury and lead in sediments and fish livers collected from Pago Pago Harbor. Samples from Fagasa Bay showed no evidence of the toxic substances, he noted.

"Mercury and lead are toxic substances and can greatly affect the health of a person if he or she consumes fish that contain these metals," wrote the science award-winning student. "Mercury can be extremely poisonous if it accumulates in your body where it may affect mental coordination. Lead accumulation may damage the nervous system, kidneys and can affect red blood cells sometimes resulting in anemia."

Kolose didn't stop there. He provided some insight into the cause of the contaminants in Pago Pago Harbor. "The source of mercury in Pago Harbor may be from industrial wastes. Lead may enter the harbor from the residues of old house paint, old paint cans discarded in streams emptying into the harbor, discarded batteries, the oil dock, the power plant or the marine railway," he speculated. And he envisioned disastrous results if the poisonous substances are allowed to accumulate in the food chains of Pago Harbor organisms.

He rounded off his paper with a strong recommendation to the government "that fishing not be allowed in the harbor until further tests may be carried out to determine the extent of the pollution and to determine how serious of a threat this is tc the public health."

That was in 1988, when Kolose's work won him the top award in that year's territorial Science Fair. His findings got the attention of the American Samoa Legislature ture which passed a resolution directing the relevant government agencies to undertake a toxicity study of the harbor. It was on the strength of the Fono-approved measure that the study got underway, whose results were recently made public.

Kolose is elated that the government has finally gotten around to warning people about the dangers of eating fish caught in the inner harbor. While ASG was slow in taking up his recommendation, the publicity given to his science project got some of his friends and people he didn't know to fish elsewhere

He said that a woman came up to him one day and gave him $10 and when he asked what that was for, she replied that it was a token of appreciation for his research work. The woman told him that her husband usually fishes behind the Fagatogo market and if it wasn't for his hard work, she would have never known the danger of eating a contaminated catch. The woman got her husband to fish outside the harbor.

Even some of his school mates, who were avid Bay Area fishermen stopped. Some continued to try their fishing lines in the polluted area and are still doing so to this day, he said.

Kolose is now completing his final year at the American Samoa Community College, but has directed his interests from the sea to the land. He has his heart set on becoming an entomologist and is getting good experience in the field through part time employment at the Land Grant Division. He hopes to continue his studies at a U.S. college if he can land a scholarship, but if that doesn't happen he'll be content working for the Land Grant Division until a scholarship opportunity knocks.

The 22-year old Kolose is the son of Tuni and Epenesa Fruean of Pago Pago.

samoa news, *Wednesday, October 23, 1991*

*Toxic conditions in inner Pago Pago Harbor can be serious

The recent warning from the government about the health risks associated with eating fish caught in the inner harbor compelled the *Samoa News* to do further research on behalf of our readers. Here is Monica Miller's report:

Last year, thirty-four tons of fish was harvested by local fishermen from the inner harbor. Recent government reports indicate that that fish can be hazardous to your health.

Children face the greatest health risk from eating contaminated fish caught in the inner Pago Pago Harbor. Mental retardation, cancer, kidney damage, and disease of the liver are some of the illnesses caused by contaminants found in fish tested for the toxicity study of Pago Pago Harbor. The findings of the study prompted a warning from ASG last week that fish caught in the inner harbor are not safe to eat and those found in the outer harbor should be gutted and cleaned before eating.

Peter Craig is the Marine Biologist at the Department of Marine and Wildlife Resources. He says the findings should be cause for alarm. The study, which examined the toxicity of seawater, sediments and fish in the inner harbor, showed that the fish were heavily contaminated with heavy metals (arsenic, chromium, copper, nickel and zinc) had moderate levels of pesticides (DDT) and the PCB known as Arocholor 1260.

Sediments also registered high levels of heavy metals, PCBs and oil/grease, while the seawater showed moderate evidence of heavy metals and hydrocarbons. (see chart below for health effects of contaminants)

The U.S. Environmental Protection Agency's Risk Assessment Section reviewed the draft report of the Pago Pago Harbor Toxicity Study and issued the following finding: ..."about 70-80% of the children consuming the contaminated fish could have a blood lead concentration higher than 10 ug/deciliter (dl), where IQ levels can be permanently and adversely affected."

The agency recommended that actual data be collected on blood lead concentrations in children consuming fish caught in Pago Pago Harbor, stating that this will provide more concrete information to assess the lead risk from fish consumption. It also suggested the immediate issuance of a health advisory regarding fish consumption in the harbor until more definitive data is obtained.

The USEPA im[illegible]sed upon local authorities the need to get started on the blood screening program as soon as possible because of the "potential seriousness of the situation" and offered assistance in coordinating the effort and initiating discussions with the U.S. Centers for Disease Control on how to go about it.

Local agencies which coordinated the toxicity study include the Department of Marine and Wildlife Resources, American Samoa Environmental Protection Agency and the American Samoa Coastal Zone Management Program. Those agencies consulted with the local Department of Health after receiving the report from the USEPA, and the result was the issuance last week of the health advisory telling the public not to eat fish from the inner harbor and that fish caught outside the restricted area be cleaned and gutted before eating.

The Health Department is now exploring ways to facilitate the blood screening program and is contacting the Centers for Disease Control in Atlanta, Georgia for guidance and possible funding. Details will be announced as soon as the program is in place.

While the study did not examine toxicity in the outer

(Continued on page 6)

LETTERS TO THE EDITOR

Dear Editor:

The most upsetting aspect of ASEPA's recent warning that fish caught in Pago Pago Bay are not fit for human consumption is not the reality of what that means about what we have all allowed to happen to our harbor, but how the announcement seemed to be passively accepted by the community at large.

It seems as if the scientists and the regulatory agencies have only confirmed something that everybody already knew. "Who would eat fish caught there?" was the question most often heard. Not "Who is responsible for our not being able to eat fish caught there?" The prevailing mood seems to be acceptance, not outrage.

That is frightening. Because if we cannot become angry about and concerned about how we have allowed our once sustaining resources to become poisonous threats then we are going to let that pattern repeat itself. The evidence of that lack of concern blossoms poisonously all around us in the Territory.

The fact that it is our children who are most seriously threatened by this winked-at contamination is the most telling indictment of the prevailing attitude. Our children's minds and bodies and future are placed in jeopardy, and we sit and accept that as part of the status quo, part of the price of "progress."

Passivity is not progress. And that includes the passivity of excusing it as someone else's problem. If some foreign power--some Saddam Hussien--was doing this to our island and our children and ourselves, we would rise up in arms.

This poisoning and greed-fueled destruction of our island's sustaining ecosystems must stop. And it will only stop if we each, as individuals and aiga and nu'u accept responsibility for what has been given to us and what we are passing on to our children.

JOHN ENRIGHT

10/21/91

Health Effects of Contaminants Found in Inner Pago Pago Harbor

CONTAMINANT	HEALTH EFFECTS
cadmium	bronchitis, emphysema, anemia, renal stones, gastric upset, kidney tissue damage
chromium	kidney tissue damage, gastrointestinal damage, cancer
copper	gastrointestinal irritation
lead	reproductive function effects (men), mental retardation, blood cell production effects
mercury	kidney damage, nervous system effects, death
nickel	respiratory cancer, dermatitis
silver	anemia, blue-gray skin
arsenic	severe toxicosis (gastrointestinal distress, cardiac effects), nervous system effects, skin changes, cancer
DDT	convulsions
PCB	liver damage, peripheral neuropathy

Today's paper includes "B" and "C" sections

PAGO PAGO, AMERICAN SAMOA FRIDAY, NOVEMBER 15,

HARBOR FISH

To eat them or not, the choice is yours

Residents are still fishing in the inner harbor despite an ASG advisory that fish caught in the area between Leloaloa and the Rainmaker Hotel may cause mental retardation in children and other negative health effects.

It now appears that, contrary to earlier press reports, the government is not taking [illegible] fish caught in the area of contamination to unsuspecting customers. Earlier, we had reported that the government was warning local commercial establishments not to buy fish caught in the Harbor, because it would be illegal to peddle the contaminated fish. The warnings were reportedly delivered several weeks ago, primarily by staff members of the Department of Marine and Wildlife Resources.

Yesterday, however, the *Samoa News* learned that the Public Health Division of the Department of Health is not supporting the preventative health efforts of DMWR and American Samoa Environmental Protection Agency (ASEPA).

In a phone conversation with Director of Public Health Dr. Edgar Reid, the official told the *News* that the preliminary toxicity study did not contain enough solid evidence to prove that people eating the fish can get poisoned. "He stated that until a blood sampling program is conducted [illegible] there is no way to prove that consuming fish caught in the harbor is detrimental to the people's health, and that Public Health is therefore taking no action to prevent the commercial sale and reselling of fish caught in the inner harbor.

(EDITOR'S NOTE: After making his comments, Dr. Reid stated quite clearly that he did not want them printed in the newspaper, but he did not disavow his comments, and we felt that the public policy implications of his statement overrode his request, especially since they had been made in the course of an interview with a Samoa News journalist who was seeking information about what the territory's public health agency was doing about the situation.)

The physician said that the only thing the government is empowered to do is to advise the public about the potential effects of eating fish caught in the harbor (which it is doing), but it cannot stop people from fishing. Neither can his agency stop fishermen [illegible] fish caught in the inner harbor from selling their catch, he said.

The public health official drew a comparison with another "nasty habit": cigarette smoking. The evidence clearly proves that cigarette smoking is bad for your health, but Dr. Reid noted that the government is not authorized to stop people from smoking. He said there is no difference between the consumption of what's believed to be contaminated fish and cigarette smoking. "We just tell people that smoking is bad for their health; they make the choice," he stated.

Local marine biologists and environmental officials here and on the mainland offer a somewhat different perspective. A U.S. Environmental Protection Agency Risk Assessment team that looked at the potential health risks caused by consuming fish caught in the harbor said, "The high levels of (toxic) metals found in fish tissue could be cause for concern and warrants further investigation. In particular, the high levels of lead found in fish tissues and the potential effects of consumption of these fish by children is a cause for great concern."

In an earlier interview with *Samoa News*, Marine Biologist at the Department of Marine and Wildlife Resources Peter Craig said that the evidence from the preliminary toxicity study report was overwhelming and no one should be allowed to eat fish from the inner harbor area. Experts at the local EPA office

(Continued on page 8)

DOLPHIN-SAFE

StarKist has Flippers approval

NEW YORK (AP) — An environmental group said Thursday it has enlisted Starkist Seafood Co. in its efforts to tighten worldwide monitoring of tuna fishing and refit ships to protect dolphin.

StarKist will begin displaying the "Flipper Seal of Approval" on its tuna cans for adhering to the new standards, said Don White, president of Earthtrust, a dolphin-protection group based in Hawaii.

All three leading U.S. tuna canners agreed last year to halt buying tuna caught in nets that also trapped dolphins. President Bush signed a bill that set labeling standards for products billed "Dolphin Safe."

The other leading U.S. canners — Bumble Bee Seafoods Inc. and Van Kamp Seafood, maker of Chicken of the Sea tuna — were asked to adopt the tighter standards but haven't agreed to, said John Lindelow, director of the Flipper seal program.

Correction

Yesterday's front page story on the EOB windows contained a slight error. The window in the Governor's Office was shattered six months ago, not four weeks ago as the article stated. The window has since been replaced.

TGI Fr

Worried about what to d
the time? Well worry n

Come on down to the
tonight or Saturday about
treated to some live entert
Class of the Fine Arts Depar

"It was a Dark and Storr
by Tim Kelly and promises
everything (but the kitchen
nuts. The play is a spoof (c
from the 1940s and 1950
wasn't what you expected, t
it.

Don't miss your oppor
support the future Samoan
[illegible]
children and college stude
card, you can bet this sh
money!

If "let's get physical" is m
catch Week Nine of A
Saturday.

The WVUV Game of the
Marist Field where the Taf
meet the Crusaders (1-6). T
their first game in the "Batt
is Marist's final game of t
will have to play their final
undefeated Samoana Shark

Following the game, Mari
have a motorcade in h
festivities, the highlight of v
Homecoming Dance Satu
Clubhouse in Tafuna beginn

The Fagaltua Vikings (4-
in the season to p
opponent is the Sharks (6-
more games to play in the 1

The tension will be felt
Vikings fail to defeat the
has the ASHSAA Champion
they loose their final game
unlikely.)

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and will be hoping for a mi
rooting for Fagaltua.) Eith
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In other sports, don't f
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afternoon at Pago Park
game. Softball games at
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Volleyball League will pl
beginning at 8 a.m. also on

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flop. (Maybe it's hero bu
Committee of the Vetera
be having a special mee
Hotel on Saturday beginnin

All you vets are asked to
objective is to discuss t
reactivation of the Veter
Association.

* FISH

from page one

agree.

But, these agencies do not have the legal authority to stop people from fishing in the inner harbor or from selling what's believed to be contaminated fish. Only the Health Department has that authority, they've been advised by the environmental attorney at the Attorney General's Office.

The USEPA experts also recommended that a blood screening program be conducted as soon as possible, a recommendation that the local government is trying to find the funds to implement as soon as possible.

The Health Department is seeking funds from the National Centers for Disease Control and the World Health Organization to conduct such a blood sampling program for both Bay Area residents and those living outside the harbor.

In the meantime, the fishing in what local biologists refer to as a "cesspool" continues and some of these fish may be finding their way to stores and fish markets around the territory. Although store owners and fish market operators have been warned, no government agency is keeping tabs of where the inner harbor fish end up so there's no way of telling. ASG agencies have advised fish buyers to always ask where the fish came from before they make their purchases.

A DMWR biologist observed that getting people to understand that the fish they're eating or giving their children to eat can be deadly will require a lot of public education. "You'll have to show that someone died from eating the bad fish before people start paying attention," he noted. But as Craig pointed out, no one gets sick from eating the contaminated fish right after they consume it. It's the accumulative factor of eating toxic fish that will eventually cause health problems, he said.

Meanwhile the public awareness campaign is reaching new heights. A public education team has gone into the schools for discussions with both teachers and students about the ill effects of eating fish from the inner harbor, church ministers have been encouraged to spread the word in their Sunday school classes and church meetings, and doctors and nurses have also been asked to help out. Meetings with village pulenu'u will be held next week and the Fagatogo aumaga will be asked to help out in educating villagers who fish caught between Leloaloa and the Rainmaker.

Elsewhere, the fishing advisory has received continuous play on radio and newspapers. A panel discussion on television will be filmed soon. Billboards produced by various agencies will soon be erected in popular fishing spots in the Bay Area and the Fagatogo aumaga will be approached to protect the signs from vandalism.

All the focus now is on preventing people from eating the bad fish and getting more funds to study whether the toxins are present in local residents who may have had contact with contaminated waters and marine life. There has been no talk of finding out who and what caused the poisoning of Pago Pago Harbor.

Desert S
gets pri
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NEW YORK (AP)
When the wedding bells
ringing for Staff Sgt. Ro
Snow, the cash register's
start. The Desert Storm v
getting a $100,000 wed
gift from the Saudi princ
met while hospitalized
injuries suffered in the
War.

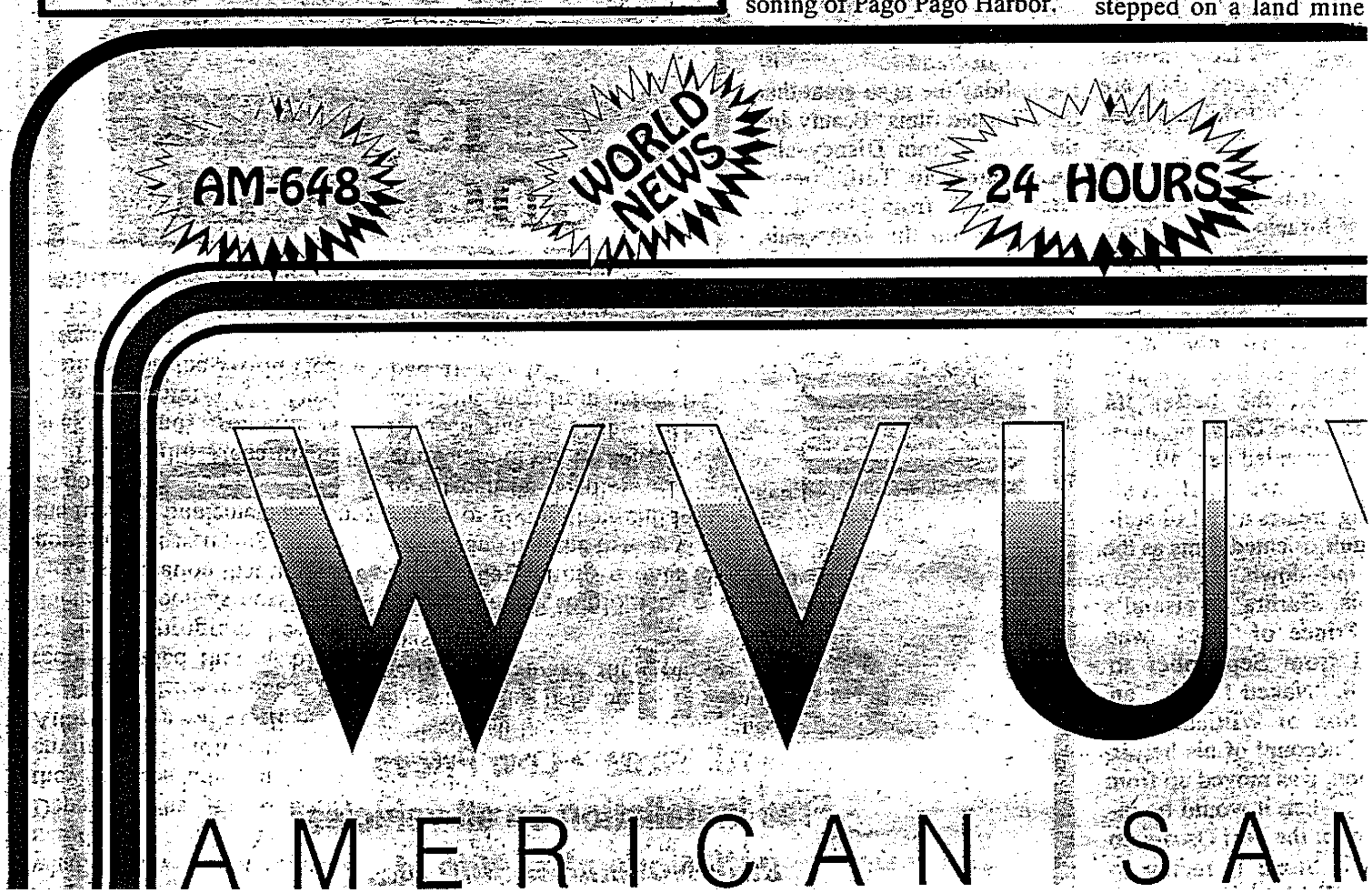
"It really is a fairy
story," said Karin Pajor
bride-to-be in the Friday
nuptials. "Not everybody
royalty at their wedding".
a card with a check
$100,000 inside, as she
too polite to add.

Think nothing of it,
the prince.

Not only is Prince Ba
providing the generous
but he canceled meeting
Capitol Hill, at the State
partment and with fe
diplomats to attend the re
tion Friday evening in F
ington, Conn. The wed
will be held in ne
Southington, where the b
and groom live.

Prince Bandar was in
Walter Reed Hospital Cen
Washington for treatment
bad back last March whe
heard about a Desert St
soldier who had underg
more surgery than any o
wounded gulf veteran.

The man was Snow,
stepped on a land mine



samoa Daily news

Today's paper includes "B" and "C" sections

PAGO PAGO, AMERICAN SAMOA FRIDAY, NOVEMBER 1, 1991 50¢

God made the fish ... it's still safe to eat, protests local fisherman

"God made the fish... it's still safe to eat." That's the explanation given by an elderly subsistence fisherman when asked why he was still fishing in Pago Pago Harbor. He said that he knew about the government advisory telling people not to eat fish caught in the inner harbor, but he did not take notice of it because he had been fishing most of his life in the area and none of his family ever got sick from eating his catch.

At the Star Kist dock on a wet Wednesday morning, six fishermen in two aluminum skiffs are reeling in their lines. One shows off his prized catch for the morning, a three pound "jack" *(tafala)*. Perched on the deck of purse seiners and Oriental longliners alongside the cannery dock, about eight other young fishermen are waiting to feel a pull at the end of their lines.

"Have you read the notice that fish caught in the harbor is not safe for eating?" I ask the oldest of the fishermen, a stocky built man, about 50 years old. He's cutting up what looked like an *aku* and throwing the pieces into the dark green, colored water. "Yes, I've read the notices," replies the fisherman.

"Then why are you still fishing here?" I asked in response. He stated that no-one in his family has been sick from eating the fish. In the second boat, the fisherman who landed the two silver jacks calls out that they don't sell their catch, that they only feed their families with the fish they haul in (this is what is known as "subsistence"). A bunch of *misiluki* bananas and a cooler sit between the two fishermen in this second skiff.

After some urging, one of the younger fishermen on board replies that he's read the health advisory telling people that fish caught in the inner harbor is not safe to eat, but he's not taking any notice of it. He assures that he doesn't sell his catch and that none of his children have fallen ill from eating the fish he puts on the table.

I try to explain that tests have shown that fish caught in the area between the Rainmaker Hotel and Leloaloa contain poisonous (toxic) substances which can make them sick, maybe not now but in the future. I ask them why they don't try fishing somewhere else and I just get a blank look. "If you love your kids, don't feed them that fish," I call out. Before our alia takes off, one of the fishermen assures that they'll think carefully about the health warning.

What we had stumbled on was an everyday happening which has continued unimpeded in spite of the recent warnings not to eat fish in the harbor... a practice which, from all indications, will take many years and a major public education effort, to stop.

(It is not illegal to fish in the inner harbor, nor to eat the fish caught there. As explained below, the government has informed commercial establishments, such as bush stores, that it is a violation of law to sell fish from the inner harbor.)

How do you tell someone who has depended on the sea for food that they can no longer fish in a certain usual area because the water is so full of poisons that the fish have also turned bad?

The fish still look okay, they're not dead so they must be safe to eat, traditional fishermen reason. How are they to know about the delayed effects of the invisible lead, oil, PCB and other toxins in the waters they've fished in for years?

The fishermen in the skiffs we saw that morning were probably part of a growing fleet of small scale commercial fishermen. Before the fish advisory was issued, the fleet was selling their catches to bush stores and restaurants around the island, with the bulk going to Bay Area establishments. Since the warning

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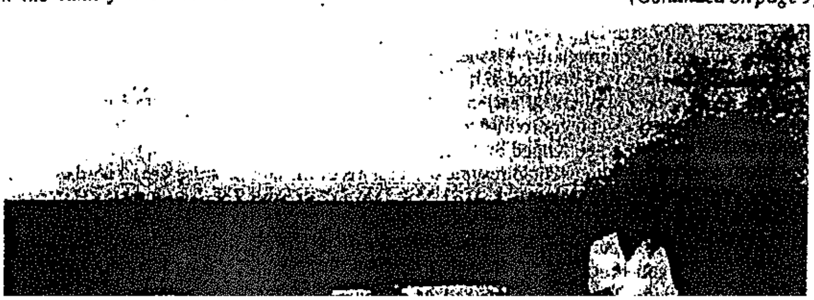

* FISH

from page one

came out, they've had a hard time selling their catch. The Enforcement Unit of the Department of Marine and Wildlife Resources has warned vendors that they face stiff fines if they knowingly sell fish caught in the inner harbor.

A DMWR spokesman said that all vendors known to have bought fish from the inner harbor fleet are no longer doing so. He said that enforcement officers are periodically patrolling bush stores and restaurants known to sell harbor fish and so far they've received very good co-operation. What's worrying DMWR and Public Health officials however is that the fishermen are peddling their susceptible catches elsewhere. They've advised the public to be cautious of buying locally caught fish and always ask the sellers where their fish was

Government agencies charged with the responsibility of informing the public about the consequences of eating inner harbor area fish have started to get the word out, about the possible health hazard from inner harbor fish almost three months after the U.S. Environmental Protection Agency suggested to ASG that it issue a health advisory about the potential

(Scientists have not yet collected enough data to prove beyond doubt that fish caught from the inner harbor are so filled with toxins that they will make people sick. But preliminary scientific analysis indicates that "70-80 of the children consuming contaminated [inner harbor] fish could have a blood lead concentration... where IQ levels can be permanently and adversely affected.")

The Governor's Office has issued two press releases and a warning notice is being published twice a week in the local newspapers. Leaflets are also being distributed to Bay Area fishermen and residents. According to government officials, the awareness campaign will include television and radio and village visitations (e.g., with village councils and pulenu'u), but these elements of the campaign have not yet begun.

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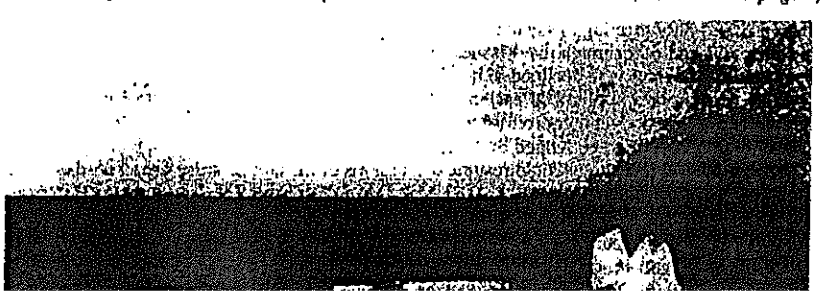

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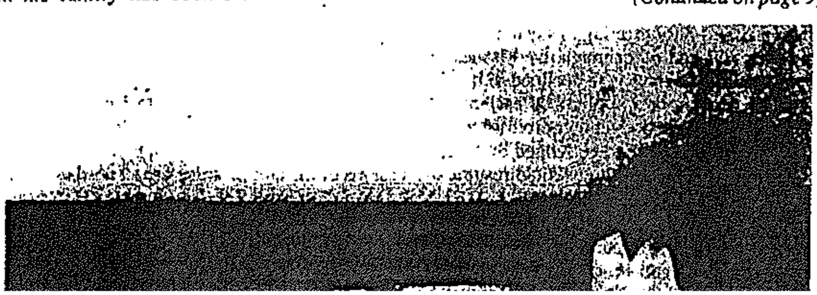

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